Pine Nut Mountains Herd Management Area Plan

PRELIMINARY ENVIRONMENTAL ASSESSMENT

DOI-BLM-NV-C020-2016-0020-EA

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BLM
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It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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1.0 Purpose of Pine Nut Mountains HMAP Environmental Assessment

1.1 Introduction

This Environmental Assessment (EA) has been prepared to analyze the Bureau of Land Management (BLM) Sierra Front Field Office (SFFO) proposal to prepare a Herd Management Area Plan (HMAP) for the Pine Nut Mountains Herd Management Area (HMA) and to gather and remove excess wild horses from within and outside the Pine Nut Mountains Wild Horse HMA in or after January 2017.

The Pine Nut Mountains HMAP would establish short and long term management and monitoring objectives for the wild horse herd and their habitat. These objectives would guide management for this HMA. This EA is a site-specific analysis of the potential impacts that could result from the implementation of the HMAP (Proposed Action) or alternatives to the Proposed Action. The EA assists the BLM SFFO in project planning, ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether "significant" impacts could result from the analyzed actions. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant Impact" (FONSI).

1.2 Background

The HMA is situated in the northern portion of the Pine Nut Mountains, in Douglas, Lyon and Carson City counties, Nevada (Project Vicinity, Figure 1; Project Area, Figure 2). All figures and maps are located in chapter 8.The Pine Nut Mountains Herd Area (HA; Figure 3) and Pine Nut Mountains HMA (Figure 4) are located within the Pine Nut Mountains.

The communities of Carson City, Minden, Gardnerville, Wellington, Smith and Dayton are spread around the edge of the Pine Nut Mountain range. The range, which runs north-south for 38 miles, includes approximately 397,899 acres of mixed ownership (public land, private land, and Indian trust land). The established boundary of the HMA encompasses approximately 90,900 acres of public lands and 14,692 acres of private lands. When the HMA was originally delineated, a large area was delineated around areas where wild horses resided in 1971, and in some cases the area included private lands, such as in the case along the northern edge of the HMA.

The Appropriate Management Level (AML) was established for the Pine Nut Mountains HMA in 1995, in the Final Multiple Use Decision (MUD). The MUD established the AML for wild horses by individual grazing allotments within the HMA. The combined total AML for the HMA is between 118-179 animals.

A Herd Management Area Plan (HMAP), has not previously been prepared for the Pine Nut Mountains so it is managed in accordance with the current policies and regulations for wild horses, but does not have management objectives specific to the HMA.

Table 1. Wild Horse AML by Grazing Allotment within the Pine Nut Mountains HMA.

Allotment	% in HMA	Wild Horse AML[1]	Wild Horse AUMs (at upper AML)	Current Population Estimate
Buckeye	12	27 – 41	493	[2]
Churchill Canyon	18	9 – 13	154	9
Clifton	77	24 – 37	444	192
Eldorado Canyon	79	15 – 22	270	99
Hackett Canyon	88	10 – 15	187	26
Mill Canyon	43	17 – 25	296	24
Rawe Peak	100	3 – 5	54	[2]
Sand Canyon	85	5 – 8	95	5
Sunrise	97	9 – 13	159	2[2]

[1] Source: 1995 MUD, BLM 2010. [2]These areas have substantial forest cover, small numbers of wild horses were likely present but not observed.

The last gather of the Pine Nut Mountains HMA occurred in December 2010, this effort was a gather and remove/fertility control treatment effort. Approximately 45 mares were gathered, treated with PZP-22 (a contraceptive which is effective for up to 22 months), freeze marked, and then released back to the HMA. Sixty-five excess wild horses that were residing outside the HMA were removed during this gather (BLM 2010a). Table 2 lists the population inventories and horse removals in the Pine Nut Mountains since 2000.

Between 2012 and 2016 the wild horse population inside and outside of the HMA has increased an average of 17 percent per year. The most recent inventory was conducted April 2016. During this inventory, 536 wild horses were observed in the Pine Nut Mountains (Figure 7), for an estimate of 579 horses. Horses outside of the HMA were included in this calculation as some of the horses move between the HMA and areas outside of the HMA.

A portion of the Pine Nut Mountains HMA contains habitat for the Bi-State Distinct Population Segment (DPS) of the Greater sage-grouse (sage-grouse). The DPS was proposed as threatened under the Endangered Species Act by the U.S. Fish and Wildlife Service (USFWS) in the Federal Register on October 28, 2013. On April 23, 2015 the USFWS withdrew the proposed listing due, in part, to commitments by multiple Federal and state agencies to continue conservation measurements outlined in the *Bi-State Action Plan for Conservation of the Greater Sage-grouse Bi-State Distinct Population Segment* (Bi-State Action Plan). USFWS will continue to monitor the status of the DPS and if, at any time, new information indicates declining implementation of the Bi-State Action Plan, they can initiate listing procedures (USFWS Federal Register, 2015). The sage-grouse is currently considered a Nevada Species of Special Concern. Portions of the HMA includes formerly proposed critical habitat for the sage-grouse. The Bi-State Action Plan identifies this vicinity as a priority area for maintaining wild horse numbers at AML and within designated herd boundaries to minimize the risk of excessive use levels and range expansion.

Table 2. Population Inventory/Horse Removals Since 2000.

Year	Action	Number of Horses*
2000	Removal	40 nuisance horses outside the HMA, Fish Springs area
2000	Population Inventory	329
2000	Removal	40 nuisance horses outside of the HMA, Dayton
2003	Removal	232 horses inside and outside HMA
2003	Population Inventory	118
2006	Removal	25 nuisance horses outside the HMA, Fish Springs area and Dayton
2007	Removal	14 nuisance horses outside the HMA, Fish Springs area
2008	Removal	2 nuisance horses outside the HMA
2008	Population Inventory	177
2009	Removal	10 nuisance horses outside the HMA, Fish Springs area
2010	Population Inventory	206
2010	Removal	46 excess horses removed from outside the HMA; 43 mares treated with Porcine Zona Pellucida (PZP-22) (or most current formulation), and returned to the HMA
2011	Removal	4 aggressive stallions, Carson City
2012	Removal	2 aggressive stallions, Carson City
2012	Population Inventory	293
2012	Removal	1 injured horse, 7 nuisance horses Dayton and Minden
2013	Removal	19 (13 nuisance and 6 aggressive horses) outside the HMA, Carson City and Fish Spring areas
2014	Removal	6 nuisance horses, Gardnerville
2014	Population Inventory	280 (many horses were missed, due to tree cover.
2015	Population Estimate	336, based on 2014 inventory
2016	Population Inventory	579 estimate, (536 seen), 357 inside the HMA, 222 outside the HMA

* Removal of nuisance/aggressive horses is in response to complaints from private land owners, or to provide for public safety.
Source: Modified from BLM 2014a.

1.3 Pine Nut HMA Final Summary of Current Conditions

In June of 2016, the BLM issued a final *Summary of Current Conditions* (Summary) that assessed the factors affecting the Bureau of Land Management's (BLM) ability to achieve and maintain a thriving natural ecological balance and multiple-use relationship on the public lands and protect the range from the deterioration associated with an overpopulation of wild horses (*Equus callabus*). The Summary took into consideration resource management goals, objectives, natural resource conditions and trends. It covered the period from the Final Multiple Use Decision (FMUD) (1995) which established stocking levels, use limits, and management objectives for wild horses and burros, livestock and wildlife to the present. Emphasis was placed on management and rangeland conditions from 2006 to 2016.

The Summary reviewed current conditions of the HMA, identified resources that are not meeting management objectives, determined the cause(s) of not meeting management objectives, and identified solutions to correct the problems identified. The Summary made the following conclusions and recommendations:

> Monitoring indicates the health of upland areas are primarily trending downward (see photos in Appendix D *of the Summary*). In the north and northeast portion of the HMA, the downward trend of upland vegetative communities coincides with wild horse use levels on perennial grass species in excess of 55 percent. Horse use in this portion of the HMA has been identified as a causal factor contributing to the recent downward trend. Utilization refers to the proportion of the current years forage production that is consumed and or destroyed by grazing animals. The FMUD established a maximum utilization rate of 55 percent for the combined use by livestock and wild horses.
>
> Recommended utilization levels are established depending upon how fully each forage species in the plant community can be defoliated and still maintain or improve in vigor. In 1995 when the FMUD was issued the number of palatable perennial grasses was declining. The FMUD established stocking levels for both wild horses and livestock based on the available forage, and modified livestock grazing seasons to reduce the number of grazing animals during vegetative growth and reproductive periods. With the exception of the Churchill Canyon and Sunrise allotments, virtually no livestock use has occurred within the HMA since 1995, however, horse numbers have exceeded the AML and the use limit of 55 percent. Palatable perennial grasses (needle grass and rice grass) are continuing to decline within the HMA. Rangeland health data indicates the biotic component of the upland plant communities have moderately departed from the reference conditions due to the absence or reduction of palatable perennial grass species. Holecheck (2004) recommends a utilization rate of 30-40 percent for ranges in poor condition. If wild horse use continues to be high or increases, the downward vegetative trend is expected to accelerate further reducing the number of wild horses that the HMA can support. To address the overuse and loss of perennial grass plants the wild horse population should be adjusted to the established AML by grazing allotment, the AMLs were established by allotment and calculated to maintain or improve rangeland condition, by allowing more use to occur the rangeland condition is deteriorating.
>
> RFAs *(Riparian Functional Assessments)* indicate the health of riparian areas within the HMA are primarily trending downward (see photos in Appendix D *of the Summary*). Of the 26 riparian areas assessed, 23 percent are in PFC *(Proper Functioning Condition)*; 19 percent of the riparian areas are rated FAR *(Functioning-at-Risk)* with a downward trend; and 58 percent of the riparian areas assessed are NF *(Non- Functioning)*. In the northeast portion of the HMA, the riparian areas are rated at FAR and NF primarily due to wild horse impacts, which overlaps with the highest wild horse inventory numbers and wild horse use. The exception is Hercules Spring which is in PFC but wild horses do not have access to the riparian zone due to fencing. The other five riparian areas rated PFC have no documented horse use or are reaches of larger systems without evidence of wild horse pressures. Of the 19 percent rated FAR, 80 percent have a downward trend due to excessive grazing and hoof action impacting riparian values, four riparian areas have

documented impacts from wild horses and one riparian area has documented impacts from livestock (cattle) grazing with no sign of wild horses. Of the 58 percent rated NF, the common impacts are from excessive horse use which has degraded riparian functionality. A few NF riparian areas are showing a drying trend over time, but data is not available to determine the exact causes of loss of riparian functionality, e.g. soil compaction; groundwater draw down from surrounding valleys; or climate change. By adjusting the wild horse population to the established AML by grazing allotment pressure on the springs and seeps would be substantially reduced, however, some of the lesser producing springs and seeps may need to be fenced for improvement to occur. Even a small number of horses can adversely impact small riparian areas as compaction due to hoof action is concentrated. Compacting wet soils can further decrease flows, prevent riparian vegetation from growing which can result in the further loss of soils. Actions to restore the ecological balance include gathering and removing excess wild horses to the low AML of each grazing allotment of the HMA, and applying population control treatments to slow the growth of the wild horse population. Additional management actions should be considered for an indefinite period of time, as environmental conditions such as drought are variable, and wild horse populations would be expected to continue to increase unless further intervention occurs. Fencing riparian areas may be necessary in order for recovery to occur.

Sustainable use requires achieving and maintaining a thriving natural ecological balance and multiple-use relationship between the wild horse population, wildlife, livestock and plant communities within and outside the HMA. Removals at this time are necessary due to the overpopulation of wild horses and to prevent further deterioration of rangeland resources. Genetic data should be collected to ensure that acceptable genetic diversity is maintained within the remaining herd. If necessary a few horses from a different HMA may be released into the HMA to increase genetic diversity.

1.4 Purpose and Need for Action

The Proposed Action (the Pine Nut Mountains Herd Management Area Plan) is designed to achieve and maintain a population size within the established AML, establish short and long term management and monitoring objectives for the wild horse herd, and protect rangeland and riparian resources from further degradation. The design feature of applying population control treatments to slow the growth of the wild horse population will allow for longer periods of vegetative and habitat recovery and extend the time between gathers.

The purpose of the Herd Management Area Plan (HMAP) is to restore a thriving natural ecological balance and multiple use relationship on public lands in the area consistent with the provisions of Section 3(b)(2) of the *Wild Free-Roaming Horses and Burros Act* of 1971 (WFRHBA).[1]

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1 The Interior Board of Land Appeals (IBLA) defined the goal for managing wild horse (or burro) populations in a thriving natural ecological balance as follows: "As the court stated in Dahl vs. Clark, supra at 594, the 'benchmark test' for determining the suitable number of wild horses on the public range is 'thriving natural ecological balance.' In the words of the conference committee which adopted this standard: 'The goal of WH&B management should be to maintain a thriving ecological balance (TNEB) between WH&B populations, wildlife, livestock and vegetation, and to protect the range from the deterioration associated with overpopulation of wild horses and burros.'"

The need arises from impacts caused from the current overpopulation of wild horses. Over use has caused soil compaction, removal of vegetation in riparian areas, reduction of perennial grasses and forbs, and an increase in bare soil. There is a need to reduce the amount of bare soil in order to decrease erosion potential. There is a need to increase perennial grass and forb cover to improve habitat and forage for Bi-State sage-grouse and other wildlife. Additionally, there is a need to manage for proper functioning conditions of riparian areas for water resources and habitat values.

Rush Spring, July 21, 2015, The depression filling most of the foreground was the pond, now supporting sagebrush.

Rush Spring May, 1990. This large pool has been complety dry for at least the past five years and the flow is now substantially less than one gallon per minute.

Rush Spring, May 1990, a portion of the pool is visible in the upper right.

Urrutia Spring, Clifton Allotment: over use by wild horses has removed all riparian vegetation thistles are becoming established. The soils have been compacted by overuse.

Urrutia Spring, February 3, 2015.

Urrutia Spring,1990.

Egus Spring July 2013. A second band of horses waiting for the first band of horses to leave the seep. This is one of many low producing seeps in the area, horses may wait hours in the summer for water. Fights between horses are not uncommon in these situations and often the stallions force their band to leave the spring before all of the animals have had an adequate drink. Wildlife undergo stress as they cannot obtain water while the horses wait for the small depressions to fill.

When native bunch grasses are over used, they will lose vigor and if the over use is at a sufficient level and duration they will eventually die and may be replaced by less palatable species or noxious weeds. The following are pictures of over used grasses within the HMA.

Over used Indian rice grass in Clifton Allotment, March 19, 2015.

Over used *Poa*, Clifton Allotment, March 19, 2015.

Over used needlegrass in Clifton Allotment July 21, 2015.

1.5 Land Use Plan Conformance

The preliminary EA is in conformance with the Carson City Field Office Consolidated Resource Management Plan (CRMP), May 2001:

- WHB-1, #2. "Remove excess wild horses from public land to preserve and maintain a thriving ecological balance and multiple-use relationship."
- WHB-2, Desired Outcomes #2 – "Maintain sound thriving populations of wild horses within herd management areas."
- WLD-2, Desired Outcomes #4 – "Maintain and improve wildlife habitat, including riparian/stream habitats, and reduce habitat conflicts while providing for other appropriate resource uses."
- WLD-2, Desired Outcomes #6 – "Maintain or improve the condition of the public rangelands so as to enhance productivity for all rangeland values (including wildlife)."

The Greater Sage-Grouse Bi-State Distinct Population Segment Forest Plan Amendment and Record of Decision (BLM 2016a) outlines certain habitat conditions and restrictions on activities which would impact the management of wild horses in Bi-State habitats.

- B-WHB-S-01: "Appropriate management levels in territories and herd management areas with habitat shall be based on the structure, condition, and composition of vegetation needed to achieve Bi-State DPS habitat objectives."

1.6 Relationship to Laws, Regulations, and Other Plans

The Proposed Action and Alternatives are in compliance with the following federal, State, and local plans to the maximum extent possible:

- Federal Land Policy and Management Act (FLPMA) of 1976 (43 U.S.C. 1701 et seq.);
- Fundamentals of Rangeland Health (43 CFR 4180);
- Migratory Bird Treaty Act (1918 as amended) and Executive Order 13186;
- National Environmental Policy Act of 1969 (as amended);
- National Historic Preservation Act of 1966, as amended;
- Public Rangelands Improvement Act of 1978;
- State Protocol Agreement between the BLM, Nevada and the Nevada Historic Preservation Office (2009);
- Special Status Species Manual and Direction for State Directors to Review and Revise Existing Bureau Sensitive Species Lists (IM No. NV-2011-059);
- Taylor Grazing Act of 1934 (as amended);
- Wild Free-Roaming Wild horses and Burros Act of 1971 (as amended);
- Wild horses and Burros Management Handbook (H-4700-1);

- Record of Decision and Land Use Plan Amendment for the Nevada and California Greater Sage-Grouse Bi-State Distinct Population Segment in the Carson City District and Tonopah Field Office 2016.

The Proposed Action and action alternatives are consistent with the applicable regulations at 43 CFR 4700 and are also consistent with the WFRHBA, which mandates that BLM "*prevent the range from deterioration associated with overpopulation*," and "*remove excess wild horses in order to preserve and maintain a thriving natural ecological balance and multiple use relationships in that area."* Additionally, federal regulations at 43 CFR 4700.0-6 (a) state that, "*Wild horses shall be managed as self-sustaining populations of healthy animals in balance with other uses and the productive capacity of their habitat*."

The Interior Board of Land Appeals (IBLA) in *Animal Protection Institute et al*, (118 IBLA 75, 1991) found that under the WFRHBA, "excess animals" must be removed from an area in order to preserve and maintain a thriving and natural ecological balance and multiple-use relationship in that area. Regulations at 43 CFR 4700.0-6 (a) also direct that wild horses be managed in balance with other uses and the productive capacity of their habitat. 43 CFR 4700 regulations governing the management of wild horses include:

- 43 CFR 4700.0-6: (a) "Wild horses shall be managed as self-sustaining populations of healthy animals in balance with other uses and productive capacity of their habitat."

- 43 CFR 4710.3-1: Herd management areas. "Herd management areas shall be established for the maintenance of wild horse and burro herds. In delineating each herd management area, the authorized officer shall consider the appropriate management level for the herd, the habitat requirements of the animals, the relationships with other uses of the public and adjacent private lands, and the constraints contained in 43 CFR 4710.4. The authorized officer shall prepare a herd management area plan, which may cover one or more herd management areas."

  Although 43 CFR 4710.3-1 states that the BLM shall prepare a herd area management plan, this regulation does not set a timeframe to complete such plan, nor does the regulation require that a plan be in place in order for the BLM to complete a gather plan.

- 43 CFR 4710.4: Constraints on management. "Management of wild horses and burros shall be undertaken with limiting the animals' distribution to herd areas. Management shall be at the minimum feasible level necessary to attain the objectives identified in approved land use plans and herd management area plans."

- 43 CFR 4720.1: "Upon examination of current information and a determination by the authorized officer that an excess of wild horses or burros exists, the authorized officer shall remove the excess animals immediately."

1.7 Decision to be Made

The authorized officer would determine whether to implement all, part, or none of the proposed

action as described in Section 2.1 to manage wild horses within the HMA. The authorized officer's decision would not adjust livestock use within HMA, as this was set through previous decisions. The authorized officer's decision may set or adjust AML, select goals and objectives for management of wild horses within the Pine Nut Mountains HMA, select gather methods, timeframes of actions, and numbers of horses gathered, treated and released depending on the alternative or parts of any alternative chosen.

1.8 Scoping and Identification of Issues

Public Involvement was initiated on this Proposed Action on September 8, 2015 the BLM released the *Pine Nut Mountains HMA Draft Evaluation* for 45-days, detailing the BLM's monitoring of the conditions in the HMA (BLM 2015a). The document was a synthesis of monitoring and trend data collected by the BLM. On September 8, 2015 the BLM issued a press release providing public notification of the availability of the draft Evaluation and maps. Notification was also made to 94 individuals or organizations on the Carson City District wild horse mailing list, and 27 individuals or organizations on the BLM Nevada State Office wild horse mailing list. On September 10, 2015 the announcement was published in *The Horse* (website), and September 11, 2015 in *The Record-Courier* (newspaper). On September 16, 2015 an article appeared in the *Nevada Appeal* (newspaper; with a statement that the input period had been extended until October 22, 2015). On September 19, 2015 the press release was published on the *Protect Mustangs* website. On September 21, 2015 the BLM issued a second press release announcing the extension of the input period from September 22, 2015 until October 20, 2015. Articles on the public input extension appeared on September 22, 2015 in *The Horse* (website) and *Carson Now* (website), and in the *Reno-Gazette Journal* (newspaper) on September 26, 2015. Although there was an error in the second press release, the BLM on its website stated that data would be accepted until October 22, 2015.

On June 6, 2016 the BLM released a press release announcing a 30-day public scoping period. Notification by email or letter was also made to 94 individuals or organizations on the Carson City District wild horse mailing list, and 27 individuals or organizations on the BLM Nevada State Office wild horse mailing list. On June 6, 2016 the announcement was published in the *Elko Daily News* (newspaper), *KTVN-Reno Channel 2* (internet), *News Locker* (website), *NEWSbout* (website), Topix (website) and the *Record-Courier* (newspaper). The announcement was published in *The Horse* (website) on June 7, 2016 and Virginia City News (newspaper) on June 10, 2016. Posts of the news release were also published on the *American Wild Horse Preservation Campaign, Return to Freedom, Wild Horse Advocates* and *Protect Mustangs* Facebook pages. The public scoping period ended on July 7, 2016. The BLM received 91unique scoping emails containing comments from individuals and, 4,469 electronically generated emails through American Wild Horse Preservation Campaign containing the same comments and two faxes. All unique scoping comments were read, reviewed, and summarized in the scoping report.

Based on internal scoping and experience with previous HMAPs, and gathers, the following issues have been identified:

1. Sustain Healthy Populations of wild horses:

- Sex ratios
- Age Distribution
- Genetic mix (diversity)
- Population control
- Gather and Handling Methods

2. Healthy wild horse habitat. Measurement indicators for this issue include:
    - Rangeland Health
    - Potential impacts to vegetation/soils and riparian/wetland resources.
    - Disperse Wild Horse Use (forage utilization).

3. Impacts to individual wild horses and the herd. Measurement indicators for this issue include:
    - Projected population size and annual growth rate (Win Equus population modeling);
    - Expected impacts to individual wild horses from stress due to handling;
    - Expected impacts to herd social structure;
    - Expected effectiveness of proposed fertility control applications;
    - Potential effects to genetic diversity; and
    - Potential impacts to animal health and condition.

4. Impacts to wildlife, migratory birds, and threatened, endangered, and special status species and their habitats. Measurement indicators for this issue include:
    - Potential for temporary or prolonged displacement or disturbance of wildlife species;
    - Potential for trampling of wildlife species, nests, or habitats;
    - Potential competition for forage and water over time;
    - Inadequate or poorly maintained water sources to aid in dispersal of wild horses throughout the HMA.

2.0 Proposed Action and Alternatives

This section of the EA describes the Proposed Action and alternatives, including any that were considered but eliminated from detailed analysis. Four alternatives are considered in detail:

- Alternative A: Proposed Action – Implement HMAP with a management strategy which would include a number of population control methods. Adjustment to the low AML while maintaining a breeding population of animals.. Gather/removal of excess wild horses, and apply fertility control.
- Alternative B: Same as Alterative A (Proposed Action) without fertility control.
- Alternative C: Same as Alterative A (Proposed Action) with sterilization (geld and spaying).
- Alternative D: No Action – Continue Existing Management. No Gather and Removal

2.1 Alternative A: Proposed Action--Proposed HMAP

The Proposed Action is the development and adoption of a Pine Nut Mountains Herd Management Area Plan (HMAP). The Pine Nut Mountains HMAP would establish short and long term management and monitoring objectives for the wild horse herd and their habitat. These objectives would guide management for this HMA.

The proposed Plan includes goals, objectives for implementation and monitoring, targets, triggers for adaptive management, policies, and Standard Operating Procedures for management of wild horses and their habitat with the Pine Nuts. Topics covered in the HMAP include:

- Habitat Objectives
- Herd Population Objectives
- Routine Monitoring, Evaluation, and Decision-Making Frameworks
- Methods and Procedures for Gather and Removal of Horses
- Use of Fertility Control and other Population Control Methods
- Range Improvements
- Water Hauling
- Partnerships
- Public Information & Education
- Evaluate at 10 years.

The Proposed Action also includes an initial gather of approximately 500 excess horses from the Pine Nuts, as a corrective action to address current degraded habitat conditions and downward habitat trend. The initial gather would start no earlier than January 2017 and will be conducted in the Clifton, Eldorado Canyon, Mill Canyon and Hackett Canyon grazing allotments within the HMA, and in areas outside of the HMA. The intent is to gather horses to low AML by allotment. Initial gather activities will not occur in Buckeye, Churchill Canyon, Rawe Peak, Sand Canyon and Sunrise grazing allotments, as they are currently within AML for their respective allotment.

2.2 Alternative B-Proposed HMAP without Contraceptives

Alternative B would implement All Gather and Treatment Options in Alternative A, the Proposed Action, except that mares would not be treated with contraceptives.

2.3 Alternative C-Proposed HMAP plus Geld and Spay

Alternative C would implement All Gather and Treatment Options in Alternative A, the Proposed Action. In addition, some horses would be spayed or gelded. The Standard Operating Procedures for Field Castration is included in Appendix D.

- Approximately 20% of the male population of the herd (about 10 animals) would be managed as a non-breeding population of geldings.
- Approximately 20% of the female population of the herd (about 10 animals) would be managed as a non-breeding population of mares.
- The balance of the herd (or about70 animals) would be managed as a breeding population.

2.4 Alterative D-No Action-Continue Existing Management/No Gather and Removal

Under this Alternative no gather would occur and no additional management actions would be undertaken to control the size of the wild horse population at this time.

- Existing monitoring including: utilization, forage condition, water availability, animal health and periodic population census and sampling for genetic diversity would continue.
- Existing water developments would be periodically maintained.
- Nuisance animals and those posing a risk to public safety would continue to be removed.

2.5 Alternatives Considered But Eliminated From Further Analysis

Water/Bait Trapping in Lieu of Helicopter Gather.
Water trapping as the sole capture technique within the Pine Nut Mountains HMA is impracticable due to the large area that the wild horses range, limited road access to potential trap sites, and scattered water sources to effectively achieve the purpose and need. Under all alternatives bait/water trapping may occur to control animals that leave the HMA and/or to augment management objectives if a follow-up helicopter gather cannot be scheduled. However, it would not be an effective primary method to achieve the Proposed Action based on the current wild horse population size and distribution.

Designation of the HMA to be Managed Principally for Wild Horses.
This action under 43 CFR 4710.3-2 would require the amendment of the CRMP, which is outside the scope of this preliminary EA. Only the BLM Director or Assistant Director (per BLM Manual 1203: Delegation of Authority) may establish a Wild Horse and Burro Range, after a full assessment of the impact on other resources through a land use planning process.

Gathering Wild Horses to the Upper Limit of the AML for the HMA.

This alternative would only remove the number of excess horses necessary to achieve the upper limit of AML. A post-gather population size at the upper limit of the AML (179 animals) would likely result in the AML being exceeded following the next foaling season. The upper limit of the AML represents the maximum population at which a thriving natural ecological balance can be maintained. Additionally, removing animals to the upper limit would not address the overuse problems in the Clifton, Eldorado, Hackett Canyon, and Mill Canyon allotments. Reducing numbers to the lower limit and implementing population growth control allows for a longer interval between periodic large gathers and reduces the potential for the AML being exceeded significantly during the intervening period between gathers.

Natural Population Controls.
Wild horse populations increase or decrease due to a number of natural factors including: the nutritional value of forage consumed, weather, disease, and predation. Although predation of young foals can occur, generally their survival rate is very high. As evidenced by the population growth rates in the HMA over the past decades, natural predation and other natural factors have not resulted in mortality rates or declines in growth rates that would maintain the wild horse population within the AML range or prevent over use of the range.

Control the Excess Wild Horse Populations with Use of ZonaStat-H and/or PZP-22 Only.
This alternative would gather a significant portion of the existing population and implement fertility control treatments only, without removal of excess wild horses. This alternative would not bring the wild horse population to AML and the wild horse population would continue to grow as PZP is not 100% effective and under most circumstances less than 80% of the population can be gathered. Thus, the population would continue to increase, albeit at a slower rate of growth. By failing to remove excess wild horses, this alternative would allow existing resource concerns to escalate, and implementation of this alternative would incur significant gather and fertility control costs without achieving a thriving natural ecological balance. This alternative would not meet the purpose and need for the Proposed Action and was eliminated from further consideration.

Letting Nature Take its Course.
This alternative would leave excess wild horses on the range under the view that the population would eventually self-regulate when the range can no longer sustain the existing wild horse population resulting in significant death loss and habitat damage. Areas within the HMA have been documented as having heavy to severe grazing use by wild horses. This overpopulation has resulted in wild horses leaving the HMA to take up residence outside the HMA in their search for food and water. If the population continues to increase, this would put further pressure on vegetative and water resources, potentially resulting in irreversible degradation of some of these resources as well as increasing the potential for public safety concerns and impacts to private property.

The damage to rangeland resources that could result from excess numbers of wild horses is also contrary to the WFRHBA (Refer to Section 1.2). If the vegetative and water resources are inadequate to meet the needs of the wild horses on the range, the weaker animals, generally the older animals, mares, and foals, are the first to be impacted. The resulting population would therefore be heavily skewed towards the stronger stallions which could lead to significant social

disruption in the HMA. By managing the public lands in this way, the vegetative and water resources would likely be impacted so severely as to reach the point where they have no potential for recovery. For these reasons, this alternative was eliminated from further consideration.

Make on-the-Ground and Individualized Excess Wild Horse Determinations Prior to Removal. This alternative would be to make on-the-ground, and individualized excess wild horse determinations prior to removal under the view that a tiered or phased removal of wild horses from the range is mandated by the WFRHBA. Specifically, the BLM would first identify and remove old, sick or lame animals in order to euthanize those animals on the range prior to gather. Second, the BLM would identify and remove wild horses for which adoption demand exists by qualified individuals, such as younger wild horses or wild horses with unusual and interesting markings. Lastly, the BLM would remove any additional excess wild horses necessary to bring the population back into AML.

A tiered approach assumes that only a portion of the wild horse population is excess and that some number of horses would still remain on the range following the gather. This assumption does not apply, however, to wild horses outside the boundaries of the HMA, as all of those horses are excess and need to be removed.

With respect to removal of excess wild horses from within the HMA, this alternative could be viable in situations where the project area is contained, the area is readily accessible and wild horses are clearly visible, and where the number of wild horses to be removed is so small that a targeted approach to removal can be implemented. Under the conditions present within the Project area, however, this alternative is impractical, if not impossible, as well as less humane for a variety of reasons.

The BLM does euthanize old, sick or lame animals on the range when such animals have been identified. This occurs on an on-going basis and is not limited to wild horse gathers. During a gather, if old, sick or lame animals are found and it is clear that an animal's condition requires the animal to be euthanized, that animal is separated from the rest of the group that is being herded so that it can be euthanized on the range. However, wild horses that meet the criteria for humane destruction because they are old, sick or lame usually cannot be identified as such until they have been gathered and examined (for example, to examine the horse's mouth to determine whether the horse's dental conditions would allow it to process enough forage to survive or to check whether the horse is club footed). Old, sick and lame wild horses meeting the criteria for humane euthanasia are also only a tiny fraction of the total number of wild horses to be gathered, comprising on average about 0.5 percent of gathered wild horses (BLM 2015b). Due to the challenges of approaching wild horses close enough to make an individualized determination of whether a horse is old, sick or lame, and of accessing wild horses over thousands of acres of varied topography and terrain, it would be virtually impossible to conduct a phased culling of such wild horses on the range without actually gathering and examining the wild horses.

Similarly, rounding up and removing wild horses for which an adoption demand exists, before gathering any other excess wild horses would be both impractical and much more disruptive and traumatic for the animals. The terrain challenges, difficulties of approaching the wild horses close enough to determine age and whether they have characteristics that make them more

adoptable, the impracticalities inherent in attempting to separate the small number of adoptable wild horses from the rest of the herd, and the impacts to the wild horses from the closer contact necessary, makes such phased removal a much less desirable method for gathering excess wild horses. This approach would create a significantly higher level of disruption for the wild horses on the range and would also make it much more difficult to gather the remaining excess wild horses. Furthermore, if the BLM plans to apply any population controls to gathered wild horses prior to release, it would be necessary to gather more than just the excess wild horses to be removed, making a phased approach to removal both unnecessary and counter-productive. This alternative was therefore eliminated from any further consideration.

3.0 Affected Environment

This section of the EA briefly discusses the relevant components of the human environment which would be either affected or potentially affected by the Proposed Action or No Action Alternatives. Direct impacts are those that result from the management actions while indirect impacts are those that exist once the management action has occurred.

3.0.1 Setting

The Project area is the Pine Nut Mountains, located in Douglas, Lyon and Carson City counties, Nevada (Figure 2). The communities of Carson City, Minden, Gardnerville, Wellington, Smith and Dayton are spread around the edge of the Pine Nut Mountain range. The range, which runs north-south for 38 miles, includes approximately 397,899 acres of mixed ownership (public land, private land, Indian trust land[2]). The Pine Nut Mountains HA (Figure 3) and Pine Nut Mountains HMA (Figure 4) are located within the Pine Nut Mountains. The HA consists of approximately 183,186 acres of public lands and 68,504 acres of private lands. The designated boundary of the HMA (located entirely within the HA) encompasses approximately 90,900 acres of public lands and 14,692 acres of private lands. The southern portion of the range includes the 13,395 acre Burbank Canyon Wilderness Study Area. The topography of the range varies from rolling hills, approximately 5,000 feet in elevation, to over 9,000 feet in elevation at the tops of the tallest peaks. Vegetation is typical of the western Great Basin and is dominated by a mix of grasses (*Achnatherum* spp. and *Poa* spp.), sagebrush (*Artemisia* sp.), rabbitbrush (*Chrysothamnus viscidiflorus*), bitterbrush (*Purshia tridentata*), and pinyon-juniper woodlands (*Pinus monophylla-Juniperus osteosperma*). Temperatures can exceed 100 degrees Fahrenheit (°F) at lower elevations during July and August and can drop below 0 °F during December and January. Average annual precipitation is strongly influenced by elevation and varies from six to 16 inches.

3.0.2 Resources Considered for Analysis

The BLM is required to address specific elements of the environment that are subject to requirements in statute or regulation or by executive order (BLM 2008). Table 7 lists the elements that must be addressed in all environmental analysis and indicates whether the Proposed Action or Alternatives affect those elements. Other resources of the human environment that have been considered for analysis are listed in Table 8.

2 Trust land refers to land held in trust by the United States for an Indian tribe or an individual tribal member. This means that the United States holds legal title to that land, while the tribe or individual tribal member holds beneficial title, which means that the tribe or tribal member has the right to use the property and derive benefits from it.

Table 4. Supplemental Authorities*.

Resource	Present Yes/No	Affected Yes/No	Rationale
Air Quality, including Global Climate Change and Greenhouse Gas Emissions	Y	N	The Pine Nut Mountains are located in Carson City, Douglas and Lyon counties. All counties are in attainment status. During implementation of the Proposed Action or Alternatives, there would be negligible increases in emissions caused by motorized vehicles and aircraft. During implementation of the Proposed Action or Alternatives, there would be negligible increases in particulates caused by foot traffic, wild horses, motorized vehicles and aircraft. As these impacts would be localized, short-term and negligible, the overall air quality of the air basins would remain in attainment status.
Areas of Critical Environmental Concern	N		
Cultural Resources	Y	N	Prehistoric and historic properties occur throughout the Pine Nut Mountains. A review of previous cultural resource inventories would be conducted prior to establishing holding or trap sites. To the greatest extent possible, the holding or trap sites would be located where previous inventories have occurred and in areas previously disturbed. If during implementation, holding or trap sites are moved to other locations, a cultural resources monitor would be present to ensure than no prehistoric or historic properties are affected.
Environmental Justice	N		Resource not present.
Farm Lands (prime or unique)	N		There are no designated prime or unique farm lands in the Pine Nut Mountains managed by the BLM.
Floodplains	N		Resource not present.
Noxious and Invasive Weeds	Y	Y	Carried forward for analysis.
Migratory Birds	Y	Y	Carried forward for analysis.
Native American Religious Concerns	N		Notification of the Proposed Action has been made to the Washoe Tribe of Nevada and California, and Yerington Paiute Tribe. No religious concerns have been identified. Coordination with the tribes would continue through Project implementation.
Threatened or Endangered Species (animals)	Y	N	Within the Pine Nut Mountains, approximately 83 acres of critical habitat has been proposed along the Carson River for the western yellow-billed cuckoo (*Coccyzus americanus*). No Project activities would occur in this proposed critical habitat.
Threatened or Endangered Species (plants)	Y	N	Within the Pine Nut Mountains, approximately 14 acres of critical habitat has been designated for the Webber's ivesia (*Ivesia webberi*). No Project activities would occur in this critical habitat. If new populations are located outside the critical habitat, the BLM would exclude the area(s) from Project activities.
Wastes, Hazardous or Solid	N		No hazardous or solid wastes would be introduced in the Pine Nut Mountains.
Water Quality (Surface/Ground)	Y	N	The quality of surface waters in the Pine Nut Mountains would not be affected by the Proposed Action or Alternatives.
Wetlands/Riparian Zones	Y	Y	Carried forward for analysis.
Wild and Scenic Rivers	N		Resource not present.
Wilderness/WSA	Y	N	The Burbank Canyon Wilderness Study Area lies within the Pine Nut Mountains. No Project activities would occur in this area.

**See H-1790-1 (January 2008) Appendix 1 Supplemental Authorities to be Considered.*
Supplemental Authorities determined to be Not Present or Present/Not Affected need not be carried forward or discussed further in the document.
Supplemental Authorities determined to be Present/May Be Affected may be carried forward in the document.

Table 5. Resources or Uses Other Than Supplemental Authorities.

Resource or Issue**	Present Yes/No	Affected Yes/No	Rationale
BLM Sensitive Species (animals)	Y	Y	Carried forward for analysis.
BLM Sensitive Species (plants)	Y	Y	Carried forward for analysis.
Fire Management	Y	N	The Proposed Action or Alternatives would have no effect on fire suppression activities.
Forest Resources	Y	Y	See Vegetation section.
General Wildlife	Y	Y	Carried forward for analysis.
Human Health and Safety	Y	Y	Carried forward for analysis.
Land Use Authorization	Y	N	Various right-of-way authorizations such as overhead transmission lines and roads occur throughout the Pine Nut Mountains. These authorizations would not be affected by the Proposed Action or Alternatives.
Lands with Wilderness Characteristics	Y	Y	Lands with Wilderness Characteristics are proposed in the Pine Nut Mountains under the ongoing land use plan revision. Carried forward for analysis.
Livestock Grazing	Y	Y	Carried forward for analysis.
Minerals	Y	N	Mineral exploration occurs in the Pine Nut Mountains; however the Proposed Action would have no effect on these activities.
Paleontological	Y	N	Paleontological resources occur at the western edge of the public lands in the Pine Nut Mountains; however no Project activities would occur in these areas.
Recreation	Y	N	Dispersed recreational activities, such as sightseeing, hunting, off-highway vehicle travel, and camping occurs throughout the Pine Nut Mountains. The Proposed Action or Alternatives would have no effect on these uses.
Socioeconomics	N		Resource not present.
Soils	Y	N	During implementation of the Proposed Action or Alternatives, there would be negligible increases in surface disturbances caused by foot traffic, wild horses, and motorized vehicles and aircraft. These impacts would be localized, short-term and negligible.
Travel Management	Y	N	Travel routes existing throughout the Pine Nut Mountains. The Proposed Action or Alternatives would have no effect on public access.
Vegetation	Y	Y	Carried forward for analysis.
Visual Resources	Y	N	During implementation of the Proposed Action or Alternatives, there would be localized, short-term and negligible impacts to visual resources in the Pine Nut Mountains from gather operations and negligible increase in particulates. Wild horse management would be consistent with all Visual Resource Management classifications.
Wild Horses and Burros	Y	Y	Carried forward for analysis.

***Resources or uses determined to be Not Present or Present/Not Affected need not be carried forward or discussed further in the document.*

Resources or uses determined to be Present/May Be Affected may be carried forward in the document.

3.1 Wild Horses and Burros

The BLM estimates that approximately 67,025 wild horses and burros (*E. asinus*) reside on BLM-managed lands in the 10 Western states, based on the latest data available in March 1, 2016 (BLM 2016b). The combined AML is approximately 26,000 animals across 179 HMAs covering more than 31.9 million acres (14.7 million acres in Nevada). No burros are present on BLM-managed lands in the Pine Nut Mountains and this species is not discussed any further.

After the passage of the WFRHBA, the BLM identified HAs for BLM-managed lands with known populations of wild horses. HMAs were established later for those HAs through a land use planning process that set the initial and estimated herd size that could be managed while still preserving and maintaining a thriving natural ecological balance and multiple-use relationships for the area. An area must have four essential habitat components to be designated as an HMA including: forage, water, cover and space (BLM 2010). For each HMA, the AMLs for wild horses are set; no AML is set for HAs areas outside of an HMA.

The Project area for the Proposed Action is the Pine Nut Mountains, an area encompassing approximately 397,899 acres (Figure 2). The Pine Nut HA (Figure 3) and Pine Nut Mountains HMA (Figure 4) are located within the Pine Nut Mountains. The HMA has not been designated as a "Wild Horse and Burro Range" under 43 CFR 4710.3-2.[3] Table 9 lists the population inventories and horse removals in the Pine Nut Mountains since 2000.

3 There are currently four designated Wild Horse and Burro Ranges in the Western United States that are managed principally for wild horses and burros consistent with 43 CFR 4170.3-2. These include the Pryor Mountain Wild Horse Range in Montana; the Little Book Cliffs Wild Horse Range in Colorado; the Nevada Wild Horse Range and the Marietta Wild Burro Range in Nevada. Only the BLM Director or Assistant Director (as per BLM Manual 1203: Delegation of Authority), may establish a Wild Horse and Burro Range after a full assessment of the impact on other resources through the land-use planning process.

Table 6. Population Inventory/Horse Removals Since 2000.

Year	Action	Number of Horses*
2000	Removal	40 nuisance horses outside the HMA, Fish Springs area
2000	Population Inventory	329
2000	Removal	40 nuisance horses outside of the HMA, Dayton
2003	Removal	232 horses inside and outside HMA
2003	Population Inventory	118
2006	Removal	25 nuisance horses outside the HMA, Fish Springs area and Dayton
2007	Removal	14 nuisance horses outside the HMA, Fish Springs area
2008	Removal	2 nuisance horses outside the HMA
2008	Population Inventory	177
2009	Removal	10 nuisance horses outside the HMA, Fish Springs area
2010	Population Inventory	206
2010	Removal	46 excess horses removed from outside the HMA; 43 mares treated with Porcine Zona Pellucida (PZP-22) and returned to the HMA
2011	Removal	4 aggressive stallions, Carson City
2012	Removal	2 aggressive stallions, Carson City
2012	Population Inventory	293
2012	Removal	1 injured horse, 7 nuisance horses Dayton and Minden
2013	Removal	19 (13 nuisance and 6 aggressive horses) outside the HMA, Carson City and Fish Spring areas
2014	Removal	6 nuisance horses, Gardnerville
2014	Population Inventory	280
2015	Population Estimate	336, based on 2014 inventory
2016	Population Inventory	579 estimate, (536 seen)seen, 357 inside the HMA, 222 outside the HMA

* Removal of nuisance/aggressive horses is in response to complaints from private land owners, or to provide for public safety.
Source: Modified from BLM 2014a.

The allocation of forage for wildlife, wild horses, and livestock was established through a MUD, which set the AUMs for each category. The Final MUD for the HMA and nine overlapping grazing allotments was approved in 1995 (Figure 8; BLM 1995). Table 5 lists the AML by individual grazing allotment within the HMA. The AML is the range within which a wild horse population can be maintained over the long-term based on habitat suitability and monitoring data (adaptive management)[4]. The AML for the HMA was established at 118-179 animals. Because areas outside the HMA are not managed for wild horses, no AML has been set for areas outside the HMA.

The wild horse population within the HMA is not distributed evenly throughout the HMA, some allotments are sustaining heavy and severe use while others are receiving slight use (Figure 5). The distribution of horses is likely influenced by water availability and suitable grazing areas. Large tracts of closed canopy pinyon pine are present within the HMA producing very limited forage. Relocating excess horses from one allotment to another allotment would not be practical in this HMA as access is very limited and the tendency of wild horses is to return to their home ranges after release. Moreover, since the essential habitat requirements may not exist in some of

4 In *Animal Protection Institute of America v. Nevada BLM*, 109 IBLA 119 (1989) the Interior Board of Land Appeals stated that the AML represents the optimum number of wild horses which results in a thriving natural ecological balance.

the low population density areas, releasing horses into these areas may be very stressful to the released animals. For a more detailed description of this HMA see the *Summary of Current Conditions.*

3.2 Wetlands/Riparian Zones

Wetlands and riparian areas cover a relatively small amount of land in Nevada and within the Pine Nut Mountains. High quality riparian habitat can generally support more species than most other habitat types due to the presence of water and a productive nutrient-rich environment. The Pine Nut Mountains includes three types of riparian ecosystems including: perennial springs/seeps; intermittent and ephemeral streams, and aspen (*Populus tremuloides*) stands (which can indicate a shallow water table).

Principal tree species in lowland riparian areas include Fremont cottonwood (*Populus fremontii* ssp. *fremontii*) and black cottonwood (*P. trichocarpa*). Principal shrub species include several species of willow, such as grey willow (*Salix exigua*), Lemmon's willow (*S. lemmonii*), and yellow willow (*S. lutea*). Grass species include creeping wildrye (*Leymus triticoides*) and a variety of wetland species, including sedges (*Carex* spp.), rushes (*Juncus* spp.), and cattails (*Typha* spp.). Multiple drainages within the Pine Nut Mountains have riparian corridors with vegetation communities that support a diversity of wildlife.

Within the HMA, the majority of riparian areas are lentic riparian-wetland areas. Lentic riparian-wetland areas are associated with still water systems. Lentic areas provide enough available water to the root zone to establish and maintain riparian-wetland vegetation. These wetlands occur in basins and lack a defined channel and floodplain. Included are permanent (i.e., perennial) or intermittent bodies of water such as lakes, reservoirs, potholes, marshes, ponds, and stock ponds. Other examples include fens, bogs, wet meadows, and seeps not associated with a defined channel. Conversely, lotic riparian-wetland areas are associated with rivers, streams, and drainage ways. Such wetlands contain a defined channel and floodplain. The channel is an open conduit, which periodically or continuously carries flowing water, dissolved and suspended material. Beaver ponds, seeps, springs, and wet meadows on the floodplain of, or associated with, a river or stream are part of the lotic wetland. There are several lotic systems within the HMA.

Lentic and lotic riparian-wetland areas are functioning properly when adequate vegetation, landform, or debris is present to:

- dissipate energies associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality;
- filter sediment and aid floodplain development;
- improve flood-water retention and ground-water recharge;
- develop root masses that stabilize islands and shoreline features against cutting action;
- restrict water percolation;
- develop diverse ponding characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, water bird breeding, and other uses; and
- support greater biodiversity.

Most areas in the Great Basin do not have the potential or require large wood to dissipate stream energy associated with high stream flows. Vegetation such as willows, sedges and rushes can dissipate energy and are therefore *Riparian Functional Assessments* important in maintaining soil stability and preventing erosion.

The riparian functional assessment (RFA) (Technical Reference 1737-15 and 1737-16) is a qualitative method BLM uses for assessing the on-the-ground condition of riparian-wetland systems in order to determine how the system is functioning in its current state and current management. BLM is required to meet Proper Functioning Condition (PFC) for riparian areas on public lands as specified in the BLM 1737 Manual, Resource Advisory Councils Standards and Guidelines for Nevada and the Sage-Grouse Plan Amendment.

The RFA refers to a consistent approach for considering hydrology, vegetation and erosion/deposition (soils) attributes and processes to assess the condition of riparian wetland areas. The on-the-ground condition refers to how well the physical processes are functioning. PFC is a state of resiliency that will allow a riparian-wetland area to hold together during high wind events or overland flow events with a high degree of reliability. This resiliency allows an area to then produce desired values, such important habitat including forage for birds and other wildlife species. Riparian-wetland areas that are not functioning properly cannot sustain these values. In many cases erosion and channelization will occur in these non-functioning areas or stretches leading to the lowering of the water table and the further loss of wet meadow and riparian systems. Once erosion occurs in stream bottoms it is difficult to reverse and often leads to the lowering of the water table.

A RFA was conducted at 26 sites within the HMA over the last 15-years (Figure 11). Appendix F lists the name, location, allotment, and rating of those assessments. Of the 26 riparian areas assessed, 23 percent are in PFC; 19 percent of the riparian areas are rated functioning-at-risk (FAR) with a downward trend; and 58 percent of the riparian areas assessed in the HMA are non-functioning (NF). Of the 23 percent rated PFC, only one riparian area is located in Clifton Allotment (with documented heavy horse use), and has an intact fence enclosure protecting it from grazing. The other five riparian areas rated PFC have no documented horse use or are reaches of larger systems without evidence of wild horse use. Of the 19 percent rated FAR, 80 percent have a downward trend due to excessive grazing and hoof action impairing riparian values, where four riparian areas have documented impacts from wild horses and one riparian area has documented impacts from livestock grazing with no sign from wild horses. Of the 58 percent rated NF, the common impacts are from excessive horse use which has degraded riparian functionality. A few NF riparian areas are showing a drying trend over time, but data is not available to identify the specific cause of the drying trend, potential causes include soil compaction; groundwater draw down from surrounding valleys; or climate change.

Riparian Functional Assessments by Allotment

Clifton

The BLM has assessment or monitoring data on 14 riparian areas in the Clifton Allotment. Thirteen RFAs were completed in the Clifton Allotment since 2002, with 11

assessments completed in the past three years. Seven of these 14 riparian assessments have multiple ratings over time, and data shows a downward trend due to excessive wild horse use.

Currently, there is one riparian area (Hercules Mine Spring) in PFC within the Clifton Allotment. Before this riparian area was fenced, it was rated as FAR. The fence, still in place, has eliminated wild horse grazing pressure and allowed for the riparian area to recover to PFC. The fence was designed to exclude livestock and horses while still allowing wildlife access to the riparian area.

There are two riparian areas rated as FAR. West Barton Spring is FAR with a fence enclosure (put in place following the 2002 assessment) that has been pushed or knocked down multiple times in recent years. The riparian area was in recovery in 2013, with 25 identified species of riparian vegetation present. However, with the fence repeatedly pushed down in from 2013 to present, the riparian vegetation and hydric soils have been adversely impacted. The current rating of West Barton Spring reflects a downward trend due to excessive horse use. The second riparian area, Little Nettles Spring, was FAR in 2002, with a downward trend, notes cited evidence of heavy horse grazing on small willows, severe impacts to the channel banks, vegetation and water quality. Current photos show the system still exists.

Data shows that 11 springs are currently rated as NF, due to excessive wild horse use causing the loss/severe reduction of riparian vegetation, soil compaction from hoof action and degradation of hydrologic function at each site. One spring is rated NF due to loss of water, from a puncture in the confining layer which keeps water at the soil surface. Due to the loss of surface water this system is no longer be considered a spring and the associated wet meadow is now dry.

Mill Canyon

Riparian functional assessments were conducted at two riparian sites. Greg's Cabin Meadow Spring went dry sometime between 2002 and 2013. The current rating for this riparian area is NF due to lack of water. The other site, Pony Meadow Artesian Well, is FAR due to a nick point below the anthropogenic source and wild horse hoof action causing disturbance of surface and subsurface flow patterns.

Eldorado Canyon

The middle reach of Eldorado Canyon Creek is the only assessed riparian area on this allotment. The middle reach of the creek is PFC, the armored channel is stable and able to with stand high energy storm events.. The BLM has no documentation of wild horse impacts to the lower reach, however there is evidence of horse presence in the lower reach.

Hackett Canyon

Hackett Canyon Allotment has no riparian functional assessments on file, besides the Eldorado Canyon Creek assessments. Eldorado Canyon Creek is the boundary between the two allotments.

Buckeye
Buckeye Allotment has one riparian functional assessment on file from 2002. The Buckeye Allotment shares the upper reach of Eldorado Canyon Creek with the Sunrise Allotment. The upper reach of the creek is FAR with excessive erosion from undissipated stream flow due to road management issues. There are no known perennial water sources on public lands in Buckeye Allotment. Bull Run Spring ran in the 1980's, but was dry in 2012, with a 30-foot tall pinyon pine growing at the source, inside the enclosure.

Rawe Peak
Rawe Peak Allotment had a riparian functional assessment completed before 1995 with no supporting notes (rating PFC). Currently, the Rawe Peak North Spring, supporting the riparian area, is dry and not considered a functioning riparian area.

Sunrise
Four riparian functional assessments were completed in 2015 on Sunrise Allotment. One stream reach is PFC with stability of the system held in place topographically. One spring is PFC, due to removal of grazing pressure. One spring is FAR due to previous cattle grazing pressure causing surface and subsurface disturbance to the hydrologic function. The fourth riparian area is in NF condition from to lack of water, most likely due to pinyon-juniper encroachment, but potentially from a puncture to the confining layer of the spring expression.

Churchill Canyon
This allotment has one riparian area within the HMA. This riparian area, called Mud Spring, was rated NF in 2007, due to excessive erosion and rapid draining of the system.

Sand Canyon
No wild horses have been observed in the riparian areas in Sand Canyon. Two riparian function assessments were completed in 2000 and were rated PFC. The riparian areas include the newer Taperneck Spring, first observed after the Carson City effluent pond came on-line, and a reach of the Carson River. There were no wild horse or livestock sign at the time of assessment. There are no other known existing water sources on this allotment.

3.3 General Wildlife

Habitats
The Nevada Wildlife Action Plan describes 22 key habitat types and identifies wildlife species assemblages for each (Wildlife Action Plan Team [WAPT] 2012). The vegetation types in the Pine Nut Mountains can structurally and functionally be combined into three major wildlife habitats: sagebrush, pinyon-juniper woodlands, and cold desert shrub (scrubland; Figure 12). Riparian areas in the Pine Nut Mountains also provide habitat for wildlife species.

Sagebrush communities are important to a variety of wildlife, including sagebrush obligates such as Brewer's sparrow (*Spizella breweri*), sage thrasher (*Oreoscoptes montanus*), and sage sparrow (*Amphispiza belli*). Additionally, these communities are important to other species that may be

present during certain times of the year, such as pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), ferruginous hawk (*Buteo regalis*), and loggerhead shrike (*Lanius ludovicianus*). Raptors, such as ferruginous hawks, spend most of their time hunting over sagebrush where they primarily prey on ground squirrels and jack rabbits (WAPT 2012).

Pinyon-juniper woodlands provide a variety of sheltering functions for wildlife that range from hiding cover to cavities and nest sites for birds, bats, and small mammals (WAPT 2012). A critical product of these woodlands is the pinyon nut crop, which serves as an important food source for the pinyon jay (*Gymnorhinus cyanoephalus*), Steller's jay (*Cyanocitta stelleri*), western scrub jay (*Aphelocoma californica*), and Clark's nutcracker (*Nucifraga columbiana*) (Ryser 1985). Other wildlife species associated with this habitat type include ferruginous hawk, mule deer, and black bear (*Ursus americanus*).

Ricegrass (*Achnatherum hymenoides*) and shadscale (*Atriplex confertifolia*) seeds are important food sources for wildlife in cold desert shrub habitat, and soils tend to be loose and sandy or gravelly and easily excavated by burrowing animals. Wildlife species associated with this habitat type include pale kangaroo mouse (*Microdipodops pallidus*), pallid bat (*Antrozous pallidus*), and loggerhead shrike (*Lanius ludovicianus*) (WAPT 2012). Many wildlife species use both cold desert shrub and sagebrush habitats, such as sage thrasher, sage sparrow, and Brewer's sparrow.

Riparian assessments have been conducted in the Pine Nut Mountains at various spring locations (Figure 11). The characteristics of individual springs can vary tremendously in terms of flow, water chemistry, and habitats provided for wildlife species. Many spring systems important to wildlife represent little more than seeps. In addition to their critical importance to aquatic species, they also are important for terrestrial wildlife. Springs provide a vital source of water and food for a wide range of wildlife from big game to bats. None of the riparian assessments recorded any aquatic wildlife species.

Game Species

Primary game species within the Pine Nut Mountains include mule deer, pronghorn antelope, and black bear. Other upland game species include California quail (*Callipepla californica*), chukar (*Alectoris chukar*), and band-tailed pigeon (*Patagioenas fasciata*).

The Nevada Department of Wildlife (NDOW) has identified most of the Pine Nut Mountains as year-round habitat for mule deer. The north and east side of the Pine Nut Mountains is pronghorn antelope habitat. Pronghorn use lower elevations in fall and spring but move to higher elevations in deep winter and mid-summer to escape temperature extremes. All of the Pine Nut Mountains is considered habitat for black bear. See Table 11 for distribution of large game species.

Table 7. Large Game Species within the Pine Nut Mountains.

Species	Habitat Status	Acres	% of H MA	% of Pine Nut Mountains
Black Bear	Occupied	388,299	100	98
Mule Deer	Occupied	371,953	98	93

Pronghorn	Occupied	104,341	31	26

Calculations based on public and private lands.
Source: NDOW GIS data.

3.4 BLM Sensitive Species (Animals)

Species designated as BLM sensitive must be native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either:

1. There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range; or
2. The species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

A list of Nevada BLM sensitive species was released in 2011 (IM No. NV-2011-059 with the final list released in October 2011). Appendix G provides a list of BLM sensitive animals that may be present in the Pine Nut Mountains. BLM sensitive animal species use a variety of habitat in the Pine Nut Mountains. Habitats consist of sagebrush, pinyon-juniper woodlands, cold desert shrub, and riparian areas.

Bi-State Distinct Population Segment (DPS) of Greater Sage-Grouse

Bi-State sage-grouse are highly dependent on sagebrush for food, nesting structure, protection from predators, and thermal cover. In winter, almost 100% of their diet consists of sagebrush leaves. Bi-State sage-grouse use a variety of sagebrush species including mountain big sagebrush (*Artemisia tridentata vaseyana*), Wyoming big sagebrush (*A. t. wyomingensis*), low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), fringed sagebrush (*A. frigida*), and silver sagebrush (*A. cana*). They nest on the ground under low-growing brush enhanced with thick bunchgrass understory. Diverse plant communities, such as wet meadows or riparian areas and sagebrush stands interspersed with perennial forbs, with abundant insects are particularly important during the early brood-rearing period; chick survival is directly linked to availability of food and cover of grasses (GBBO 2010). The availability of quality nesting habitat, brood rearing/late-summer meadow habitat, and water are likely limiting factors in the Pine Nut Population Management Unit (PMU), according to the Bi-State Action Plan.

The Pine Nut Population Management Unit has the fewest sage-grouse of all Bi-State DPS PMUs (i.e., one population ranging in size from less than 100 to 608 birds based on data collected between 2004 and 2014) (FWS 2015). A recent 10-year trend analysis between 2003 and 2012 suggests the population in the Pine Nut PMU has been stable, but because of the current small population size and the ongoing and potential future habitat impacts, the sage-grouse population in the Pine Nut PMU is at a greater risk of extirpation than populations in other PMUs within the Bi-State area (FWS 2015).

The USGS has been monitoring sage-grouse in the Pine Nut Mountains since 2011. There are three known active leks in the Pine Nut Mountains; one in the Mill Canyon area, one in the nearby northern Buckskin Range, and one in the south end of the Pine Nut Mountains on Bald

Mountain. Breeding/nesting has been documented in the Mill Canyon area and, according to USGS telemetry data, most of those birds move from this area after the breeding period to brood-rearing/summer habitat around Mount Siegel and Bald Mountain in the south end of the mountain range. The habitat between the north and south ends of the Pine Nut Mountains serves as a crucial seasonal movement corridor. Sage-grouse appear to travel relatively long distances to summer and fall habitat; some going as far as the Bodie Hills near Bridgeport, California. Approximately 122,801 acres of Bi-State habitat occurs in the Pine Nut Mountains (23,816 acres within the HMA; Figures 2-1 and 3-1 *in* USFS 2015; Figure 9).

Pygmy Rabbit

Pygmy rabbits (*Brachylagus idahoensis*) are highly dependent on sagebrush to provide food and shelter throughout the year and are typically associated with tall, dense stands of big sagebrush growing in deep, loose soils in which they can construct burrows. Big sagebrush is the primary food source, but grasses and forbs are also eaten (WAPT 2012). The BLM and the NDOW have not documented pygmy rabbit habitat or their occurrence within the Pine Nut Mountains. According to the Nevada Natural Heritage Program, the Pine Nut Mountains is not within the range of this species (NNHP 2001) and there are no records for or known occurrences of pygmy rabbit within Douglas, Lyon and Carson City counties, Nevada (FWS 2010a).

3.5 Migratory Birds

In 2001, President Clinton signed Executive Order (EO) 13186 placing emphasis on the conservation and management of migratory birds. Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918 and EO 13186 addresses the responsibilities of federal agencies to protect migratory birds by taking actions to implement the MBTA. The BLM policy for migratory bird management is provided in Information Bulletin (IB) No. 2010-110 and is based on the 2010 Memorandum of Understanding (MOU) between the BLM and the FWS for the conservation of migratory birds. According to the MOU, BLM Priority Migratory Birds are those migratory birds that are those listed in the periodic FWS report *Birds of Conservation Concern* (FWS 2008), and those identified by the FWS Division of Migratory Bird Management as game birds below desired condition. Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are also protected by the Bald and Golden Eagle Protection Act (1940 as amended 1959, 1962, 1972, 1978).

Appendix B provides a list of migratory birds that may be present in the Pine Nut Mountains, of which several are also BLM sensitive species. BLM migratory birds use a variety of habitats in the Pine Nut Mountains, including sagebrush, pinyon-juniper woodland, cold desert scrub (shrubland), and riparian areas.

Sage sparrow, sage thrasher, and Brewer's sparrow distribution is closely tied with that of sagebrush. These species require tall sagebrush shrubs for nesting or song perches and an open understory of native bunchgrasses and forbs. They depend heavily on the shrub component for nesting substrate. Loggerhead shrikes also use mature shrubs for nesting structure, protection from predators, and thermal cover. Species such as pinyon jays use sagebrush habitat, but are more dependent on woodland habitat.

Multiple species of raptors likely occur in the Pine Nut Mountains. Current diversity exists because of the proximity of different habitat types that provide nesting, roosting, and foraging sites. For example, northern goshawks (*Accipiter gentilis*) nest in mature aspen stands surrounded by coniferous forest and/or shrubland for foraging. Ferruginous hawks can nest in juniper trees, but prefer open sagebrush for foraging. Ferruginous hawks and golden eagles spend most of their time hunting over sagebrush for ground squirrels, jackrabbits, and other prey. These raptors are limited by prey densities and need sagebrush habitat with a productive herbaceous understory that provides an abundant prey base (GBBO 2010).

3.6 Vegetation

The Pine Nut Mountains support a diversity of vegetation communities that may be generalized into three categories: pinyon-juniper woodlands, sagebrush, and cold desert scrub (shrubland) (Figure 12). These different vegetation communities are a result of elevation, moisture, soil substrate, aspect, and past land use practices.

Pinyon-Juniper Woodlands

This is largest vegetation community found in the Pine Nut Mountains. Pinyon-juniper woodlands are found on 164,377 acres of BLM-managed lands. Over the past 11,000 years, single-leaf pinyon pine has become a dominant species in the middle elevations of the region. The distribution of single-leaf pinyon is primarily a function of climate beginning abruptly at the Truckee River and Interstate 80 increasing in dominance southward. Throughout its distribution, single-leaf pinyon mixes with Utah juniper, which is the most common juniper species in the Pine Nut Mountains. Western juniper (*Juniperus occidentalis*) also occurs in the Pine Nut Mountains, although to a lesser extent.

Pinyon-juniper forests thrive in areas where annual precipitation ranges from 12 to 18 inches but can survive to lower extremes of eight inches in the Pine Nut Mountains. Elevation limits are determined at the lower extent by lack of moisture and at the upper limits by biotic competition, low temperatures, and excessive soil moisture. Within the Pine Nut Mountains, pinyon-juniper woodlands occupy elevations from about 5,000 to 7,000 feet.

Sagebrush

The sagebrush community is found throughout the Pine Nut Mountains at all elevations and aspects. This community is divided into two subgroups, big sagebrush and low sagebrush. The big sagebrush community includes three subspecies: the more common Wyoming sagebrush, which grows in dry, low elevation areas; mountain sagebrush, which grows in more moist areas and at higher elevations; and basin big sagebrush, which grows in deep sand often along washes at lower elevations. Plants associated with big sagebrush include other shrub species, grasses, and forbs. The low sagebrush community may include both low sagebrush and black sagebrush. Low sagebrush grows in colder, higher elevation sites with thin rocky soils, but may occupy areas similar to Wyoming big sagebrush and may intermix with this subspecies at the transition area between two adjacent ecological communities. Black sagebrush grows in similar conditions but prefers more moisture (Mozingo 1987), and this species is limited in range within the Pine Nut Mountains. Other constituents within the low sagebrush community include buckwheat species (*Eriogonum* spp.), lomatium (*Lomatium* spp.), lewisia (*Lewisia* spp.), balsamroot (*Balsamorhiza* spp.), and grasses.

Shrubland
Several different species assemblages are included in the cold desert scrub vegetative community; however, the most common are detailed below:

Inter-Mountain Basins Semi-Desert Shrub-Steppe—This system occurs at lower elevation on alluvial fans and flats with moderate to deep soils. This system is dominated by grasses, with an open shrub layer. The most typical grasses include Indian ricegrass, needle and thread grass (*Hesperostipa comata*), and Sandberg's bluegrass (*Poa secunda*). Shrubs present include fourwing saltbush (*Atriplex canescens*), rabbitbrush, Mormon tea (*Ephedra spp*.), and winterfat (*Krascheninnikovia lanata*). Although big sagebrush may be present, it would not be a dominant component of this system. This system is open and spotty, with uneven distribution of vegetation.

Inter-Mountain Basins Mixed Salt Desert Scrub—This system is extensive and is found in saline basins, alluvial slopes, and plains. This system experiences very low amounts of annual precipitation and has very open canopies. Shrub species often present include an Atriplex component, such as shadscale or fourwing saltbush. Other shrubs present include Wyoming big sagebrush (*Artemisia tridentata spp. wyomingensis*), rabbitbrush, Mormon tea, spiny hopsage (*Grayia spinosa*), and winterfat. The herbaceous layer varies greatly, being quite sparse in some areas and fairly dense in other areas. Grasses commonly include: Indian ricegrass, thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), western wheatgrass (*Pascopyrum smithii*), and Sandberg's bluegrass.

Inter-Mountain Basins Greasewood Flat—This system occurs on stream terraces and flats or may form rings around more sparsely vegetated playas. The soils are typically saline, with a shallow water table and intermittent flooding. Although these sites dry out during the growing season, the water table remains high enough to maintain vegetation despite the salt accumulations. The shrub canopy is often open to moderately dense, with such shrubs as: greasewood (*Sarcobatus vermiculatus*), fourwing saltbush, shadscale, and winterfat. The grass component includes alkali sacaton (*Sporobolus airoides*), saltgrass (*Distichlis spicata*), and some amount of basin wildrye (*Leymus cinereus*).

Vegetation Trends
Trends in vegetative attributes have been monitored at 18 key areas, utilizing frequency and photo trend plot methodologies. "Frequency" is the percentage of possible plots within a sampled area occupied by a target species. It is insensitive to the size or number of individual plants. The vegetation attributes monitored with frequency methods include frequency, basal cover and general cover categories (including litter), and reproduction of key species (if seedling data are collected). Frequency is a very useful monitoring method but does not express species composition, only species presence. With this method you don't make species counts-you are only concerned with whether the target species is present or absent within each quadrat. Frequency is an index that integrates species' density and spatial patterns. There are three methods of collecting frequency data and all three consist of observing quadrats along transects, with quadrats systematically located at specified intervals along each transect. These include pace, quadrat and nested frequency. The only differences in these techniques are the size and

configuration of the quadrat frames and the layout of the transect (Colson 2016). The nested frequency technique was used.

Photo plots are close-up photographs taken to provide a qualitative record of condition from year to year within a defined small area (plot). Photographs are taken from the same location and same specified height each time, providing both a permanent visual record of the past and a means to evaluate changes over time. Photo plots typically involve placing a standard-sized frame on the ground.

Monitoring locations (plots) were established to determine vegetative trends (Figure 13). Records were compiled for trend plots from 1974 to 2015. Photo trend plots were re-read in 2015. The trends for upland plant communities were primarily static to downward with the exception of two plots in the Buckeye and Churchill Canyon allotments. Some indicators of a downward trend are: 1) a reduction in the number of native perennial plant species; 2) an increase in invasive plant species; and 3) signs of soil disturbance and/or loss. Several factors influence the condition of plant communities. Some influences are wild horse grazing, livestock grazing, drought, fire, and plant community dynamics such as the expansion of pinyon and juniper woodlands.

Wild horse grazing is a contributing factor to the downward trends in upland vegetation communities within the Clifton, Eldorado Canyon, Hackett Canyon and Mill Canyon allotments. Plant species palatable to horses and livestock have declined through time and wild horse utilization of perennial grass species has exceeded recommended use levels. No livestock use has occurred within this portion of the HMA. The Final MUD reduced livestock and wild horse numbers and established a utilization standard of 55 percent which applied to the combined use of both wild horses and livestock. No livestock grazing has been permitted in these allotments, however, because wild horse numbers have exceeded AML, the utilization standard of 55 percent has not been achieved. Hackett Canyon has an active grazing permit, however, the permittee has taken non-use, the other three allotments do not have active grazing permits however, individuals have expressed interest in obtaining permits for grazing in these allotments.

Vegetative Trends by Allotment

Buckeye

Vegetative trend within the portion of the HMA in the Buckeye Allotment was static to upward. Due to downward trends in 1993, the final MUD prohibited livestock use within the HMA during the vegetative growing season (April 1- July 15). A new livestock grazing permit was issued in 2006 which changed the kind of livestock, reduced the number of permitted livestock AUMs and removed the seasonal livestock use restriction within the HMA. However, livestock have not used the portion of the allotment within the HMA since 2006. Wild horse use within this portion of the HMA since 2006, was calculated from inventory data at 60 AUMs during 2013-2014. The AML for the Buckeye portion of the HMA is 493 AUMs. Because current grazing use has been below three percent on upland vegetation, and the number of perennial grass plants remained static and increased at the monitoring locations between 2004 and 2015 current grazing is not negatively impacting plant community dynamics.

Churchill Canyon

Vegetative trend within the Churchill Canyon portion of the HMA is static to upward. Livestock use from 2005 to 2014 averaged 191 AUMs per year. No livestock use occurred in 2015. Wild horse use estimated from inventory data between 2006 and 2009 also averaged 191 AUMs per year. No wild horse use was recorded from 2010 to 2014. Perennial grass numbers declined from three in 2007 to two in 2015 but there was a species shift toward more palatable and desirable needlegrass species from Sandberg's bluegrass. Due to its higher palatability to livestock and wild horses, establishment of needlegrass indicates grazing is not currently negatively influencing the plant dynamics at this site.

Clifton

Vegetative trend within the Clifton portion of the HMA is static to downward. No livestock use is permitted or has occurred in this portion of the HMA since prior to 1988. Wild horse use estimated from inventory data has increased from 233 AUMs in 2006 to 1,800 AUMs in 2016. The highest recorded wild horse use during this time period was 1,800 AUMs in 2016. Wild horses move between allotments within the HMA and outside of the HMA. Overall the wild horse population within the Pine Nut Mountains has increased at17 percent annually since 2012 (population inventory data). The AML for the Clifton portion of the HMA is 444 AUMs. The final MUD indicated the amount and concentration of grazing use was resulting in the loss of grass plants in the mid and lower elevations of the allotment. Use of vegetation by wild horses has exceeded the combined recommended use for both livestock and wild horses. Because current wild horse grazing use was 81 percent and palatable perennial grasses declined between 1980 and 2015, horse use has been identified as a causal factor in the recent downward trend.

Eldorado Canyon

Vegetative trend within the Eldorado Canyon portion of the HMA is downward. With the exception of sheep trailing for approximately one week every year, no livestock use has occurred in this portion of the HMA since prior to 1982. Based on inventory data wild horse use increased from 117 AUMs in 2006 to 1,044 AUMs in 2016. The highest recorded wild horse use during this time period was 1,248 AUMs in 2012. The AML for the Eldorado Canyon portion of the HMA is 270 AUMs. Use of vegetation by wild horses has exceeded the combined recommended use for both livestock and wild horses. Because current wild horse grazing use was 79 percent and the number of perennial grasses is declining, horse use has been identified as a causal factor in the recent downward trend.

Hackett Canyon

Vegetative trend within the portion of the HMA in the Hackett Canyon Allotment is static to downward. Livestock use is permitted but has not occurred since prior to 1988. Based on inventory data, estimated wild horse use decreased from 417 AUMs in 2006 to 252 AUMs in 2016. The highest recorded wild horse use was 600 AUMs in 2008. Only 21 horses were recorded in the Hackett Canyon Allotment on the day of the 2016 inventory, wild horse utilization data indicates wild horses have been utilizing the Allotment. Wild

horse use was 73 percent during the 2015-2016 grazing year palatable perennial grass numbers remained static at one monitoring location and declined at the other location. The overall number of perennial grasses at the second location increased from four plants in 1980 to seven plants in 2015, but there was a species shift from Thurber's needlegrass (more palatable – deep rooted) to Sandberg's bluegrass (less palatable – shallow rooted). Wild horse use has been identified as a causal factor in the recent downward trend.

Mill Canyon

Vegetative trend within the portion of the HMA in the Mill Canyon Allotment is downward. Livestock use is not permitted in Mill Canyon and the last livestock use occurred in 1996. Wild horse use estimated from inventory data increased from six AUMs in 2006 to 240 AUMs in 2016. Horses frequently move in and out of the HMA along the eastern boundary in the Mill Canyon area, in 2014 an estimated 528 AUM's were consumed by wild horses. Because current wild horse grazing use is 73 percent within the allotment and there is a decline in the number of perennial grass species at two monitoring plots and a shift from palatable (Thurber's needlegrass) to less palatable grass species (bottlebrush squirreltail) at one monitring plot between 1980 and 2015. Wild horse use has been identified as a causal factor in the recent downward trend.

Rawe Peak

Vegetative trend within the portion of the HMA in the Rawe Peak Allotment is downward. Livestock use is not permitted within this allotment and no livestock use has occurred since prior to 1988. Wild horse use estimated from inventory data was 72 AUMs in 2013-2014. Because current grazing use was five percent on upland vegetation and perennial grass species did not decline at one plot and increased at the other plot between 1980 and 2015, current grazing has been determined to not be a causal factor in the recent downward trend. The photo record for this site shows an increasing density and size of pinyon and juniper trees between 1976 and 2015. The site is trending toward a tree state. Considering the long-term decrease in the number of perennial grasses and shrubs, a shift toward less desirable grass species and the increase in tree densities, the trend is rated as downward.

Sand Canyon

Vegetative trend within the portion of the HMA in the Sand Canyon Allotment is static to upward. There is no permitted livestock use within the allotment and livestock use has not occurred since prior to 1988. Wild horse use estimated from inventory data ranged from 54 to 108 AUMs from 2006 through 2009 and utilization was less than three percent.

One frequency transect was established in 1982 within the Sand Canyon Allotment. The data comparison from 1982 to 2015 showed no change in the percent frequency of desert needlegrass for key area 1. However, bottlebrush squirreltail has decreased from 41 percent in 1982 to 14 percent in 2015. Sandberg's bluegrass has increased from 26 percent to 37 percent in 2015.

Because current grazing use has been below three percent on upland vegetation and palatable perennial grass species increased and the total number of grasses increased at two of the three monitoring plots, current grazing has been determined to not be a causal factor in the recent downward trend. The results within Sand Canyon Allotment were mixed for the time period 1980 to 2015, there was a species shift toward less desirable species at two locations but there was also an increase in the number of grasses at two locations, which suggests declining condition early in the time period and recovery later.

Sunrise

The vegetative trend within the Sunrise Allotment portion of the HMA is static. Livestock use estimated from inventory data was from 106 to 163 AUMs from 2006 until 2014. No livestock use occurred in 2015. The final MUD specifically stated that livestock use would not be authorized until utilization levels by wild horses were below the allowable use levels for grasses and/or bitterbrush. There is no recorded wild horse use in this area for the time period from 2006 through 2014. Current grazing use has been below three percent on upland vegetation and grass seedlings were establishing at one plot and there was no change in the number of perennial grasses between 1980 and 2015 at the other plot. The overall trend in the Sunrise Allotment is static.

3.7 BLM Sensitive Species (Plants)

Table 12 lists the sensitive plant species that occur or their habitat may occur in the Pine Nut Mountains. A brief description of each plant species is provided below.

Table 8. Sensitive Plant Species That Occur or Their Habitat May be Present in the Pine Nut Mountains.

Common Name	Scientific Name
Churchill narrows buckwheat	*Erigonium diatomaceum*
Lavin's eggvetch	*Astragalus oophorus var. lavinii*
Margaret's rushy milkvetch	*A. convallarius var. margaretiae*
Pine Nut Mountains mousetails	*Ivesia pityocharis*
Sand cholla	*Grusonia pulchella*
Tiehm's peppercress	*Stroganowia tiehmiil*
William's combleaf	*Polyctenium williamsiae*

Source: BLM 2014.

Churchill Narrows buckwheat has only been documented in the Churchill Narrows portion of the Pine Nut Mountains. Churchill Narrows buckwheat grows in diatomaceous soil (soft and off-white soil created from fossilized remains of diatoms), at an elevation of 4,300 to 4,600 feet, with neighboring plant species including shadscale saltbush, ephedra, spineless horsebrush, burrobrush (*Hymenoclea salsola*), desert prince's plume (*Stanleya pinnata*), whitestem blazingstar (*M. albicaulis*), volcanic buckwheat (*Eriogonum lemmonii*), flatbrown buckwheat (*Eriogonum deflexum*), and squirreltail (BLM 2014a).

Lavin's milkvetch is a perennial herb that has been found at elevations of 5,700 to 7,467 feet. Lavin's milkvetch grows in soil typically on northeast to southeast facing slopes, badlands, small hills, or slopes that are dry, open, and barren containing gravel with clay originating from volcanic ash or carbonate (BLM 2014a).

Margaret rushy milkvetch is endemic to the Pine Nut Mountains. It typically grows at an elevation of 4,700 to 7,800 feet in rocky soils on slopes and flats in mixed pinyon-juniper and sagebrush landscapes (BLM 2014a).

Pine Nut Mountains mousetails exists on the upper north and east slopes of Mount Siegel in the Pine Nut Mountains at elevations between 6,990 and 8,550 feet. It is wetland-dependent, restricted to periodically wet areas or where the water table and/or bedrock are close to the surface in decomposed granite or sod of meadow margins. This species is associated with features such as springs, riparian corridors, and ephemeral ponds. Accompanying vegetation includes dry rush/forb meadow, adjacent surrounding sagebrush scrub, and occasionally surrounding pinyon/juniper/mountain mahogany woodlands (BLM 2014a).

Sand cholla is a stem-succulent, spiny shrub with magenta flowers. It grows in sand on dunes, well-drained slopes, flats, and borders of dry lakes and washes in desert or sagebrush scrub from 3,950 to 6,300 feet in elevation in western and central Nevada (BLM 2014a).

Tiehm peppercress occurs in the foothill and low mountain regions of the Pine Nut Mountains including Table Mountain in Lyon County. Populations occur in both high and low elevation in basaltic or sedimentary rocks and at the fringes of rocky scree or talus piles, clay soil, and the base of rock outcrops. It grows in association with shadscale, bitterbrush, sagebrush, and rarely, Utah juniper (BLM 2014a).

Williams combleaf is a small perennial aquatic or aquatic dependent herb in Washoe, Lyon, Douglas, and Mineral counties. It grows in relatively barren sandy to clay or mud margins non-alkaline seasonal lakes perched over volcanic bedrock in sagebrush, pinyon-juniper, and mountain sagebrush zones (BLM 2014a).

3.8 Livestock Grazing

Historically, livestock grazing is known to have occurred in the Pine Nut Mountains since the 1930's under BLM permitting, although sheep and/or cattle grazing are likely to have been occurring in the area since the late 1800s. The Pine Nut Mountains overlaps with 17 livestock grazing allotments, and the HMA overlaps with nine allotments (Figure 8). Areas that are "available" for livestock grazing are determined through a land use plan. Authorization of AUM's, range improvements, season of use etc. is made through a term livestock grazing permit process that includes analysis under the NEPA and public involvement. Table 13 lists the allotment name, season of use, AUMs, permit status (see also Figure 6), and type of use (cattle or sheep). Table 14 lists the allotments within the HMA, and actual use during the last 10-years.

Seven of the nine allotments haven't had any grazing for the past ten years. Churchill Canyon and Sunrise were last grazed in 2016. Prior to 2016 these allotments were not grazed year long, however if they were Churchill Canyon would have had the equivalent of 17 cows and Sunrise would have varied between nine and 14.

Table 9. Grazing Allotments in the Pine Nut Mountains HMA.

Name	% in Pine Nut Mountains	In HMA?	% in HMA	Type	AUMs	Permitted Season(s) of Use
Buckeye	98	Yes	12	Cattle	1,471	4/1 to 9/15
Churchill Canyon	72	Yes	18	Cattle	4 1,232	11/1 to 11/30 11/1 to 5/15
Clifton	100	Yes	77	No permitted use	-	-
Eldorado Canyon	100	Yes	79	No permitted use	-	-
Hackett Canyon	100	Yes	88	Cattle/ Sheep	146 39	3/15 to 6/30 3/15 to 6/30
Mill Canyon	100	Yes	43	No permitted use	-	-
Rawe Peak	100	Yes	100	No permitted use	-	-
Sand Canyon	100	Yes	85	No permitted use	-	-
Sunrise	100	Yes	97	Cattle	159	3/15 to 6/15

* Likely due to an error in GIS data.
Source: BLM 2014a.

Table 10. Grazing Allotments in the Pine Nut Mountains HMA and Actual Use (in AUMs) within the HMA.

Year*	Buckeye	Clifton	Churchill Canyon	Eldorado Canyon	Hackett Canyon	Mill Canyon	Rawe Peak	Sand Canyon	Sunrise
2006	0	0	141	0	0	0	0	0	162
2007	0	0	186	0	0	0	0	0	160
2008	0	0	189	0	0	0	0	0	159
2009	0	0	200	0	0	0	0	0	163
2010	0	0	200	0	0	0	0	0	158
2011	0	0	200	0	0	0	0	0	147
2012	0	0	200	0	0	0	0	0	159
2013	0	0	200	0	0	0	0	0	141
2014	0	0	200	0	0	0	0	0	106
2015	0	0	0	0	0	0	0	0	0
2016	0	0	200	0	0	0	0	0	157

*Based on a grazing year of March 1 to February 28.

3.9 Noxious and Invasive Weeds

Invasive species are defined by Executive Order 13112 as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Alien refers to a species that did not evolve in the environment in which it is found. This includes plants, animals, and microorganisms. Table 15 lists the noxious weeds that may be present in the Pine Nut Mountains. A brief description of each is provided below.

Table 11. Noxious Weeds That May be Present in the Pine Nut Mountains.

Common Name	Scientific Name
Canada thistle	*Cirsium arvense*
Hoary cress	*Cardaria draba*
Perennial pepperweed	*Lepidium latifolium*
Poison hemlock	*Conium maculatum*
Medusahead	*Taeniatherum caput-medusae*
Musk thistle	*Carduus natans*
Scotch thistle	*Onopordum acanthium*
Spotted knapweed	*Centaureau biebersteinii*

Source: BLM 2014a.

Canada thistle is a perennial weed that has a deep, extensive creeping root system. This weed reproduces by both roots and seeds. This weed is often found in patches or colonies due to the spreading root system and grows best in moist areas and is also found in pastures. Hoary cress is a perennial weed that grows best in disturbed, alkaline soils. This weed reproduces through roots and seed. Perennial pepperweed/tall whitetop is a perennial weed that has a creeping root system and can be found in moist areas and pastures. Poison hemlock is a biennial weed that has a thick, deep taproot. It reproduces by seed and is highly toxic to animals and humans when consumed. Medusahead is an annual weed that reproduces by seed and is unpalatable to grazing animals. This weed grows best in clay soils, often in rangelands. Musk thistle is a biennial weed that has a deep, fleshy taproot and reproduces by seed, and often infests roadsides. Scotch thistle is a biennial weed that reproduces by seed and can form dense stands that are difficult to penetrate. This weed has a fleshy taproot and often infests roadsides. Spotted knapweed is a biennial weed that has a deep, stout taproot, and can be found on dry, well drained soils, and often infests roadsides and rangelands. This weed reproduces by seed and lateral roots (NDA 2013).

Cheatgrass, an invasive weed, is also know to occur in the Pine Nut Mountains. Cheatgrass is an annual grass that displaces native perennial shrub, grasses and forbs because of its ability to germinate quicker and earlier than native species, thus outcompeting natives for water and nutrients. Cheatgrass is also adapted to recurring fires that are perpetuated in part by the fine dead fuels the plant leaves behind.

3.10 Human Health and Safety

Some members of the public are interested in observing wild horse gather operations or may be recreating on public lands during the gather. Members of the public who are present in the vicinity of the wild horse gather can inadvertently wander into areas that put them in the path of wild horses that are being herded or handled during the gather operations, creating the potential for injury to themselves, the wild horses and to the BLM employees and contractors conducting the gather and/or handling the wild horses, as well as to the public themselves. Because these wild horses are wild animals, there is always the potential for injury when individuals get too close or inadvertently get in the way of gather activities.

The helicopter work is done at various heights above the ground, from as little as 10 to 15 feet (when herding the animals the last short distance to the gather corral) to several hundred feet (when doing a recon of the area). While helicopters are highly maneuverable and the pilots are very skilled in their operation, unknown and unexpected obstacles in their path can impact their ability to react in time to avoid members of the public in their path. The same unknown and unexpected obstacles can impact the wild horses being herded by the helicopter in that they may not be able to react and can be potentially harmed or caused to flee, which can lead to injury and additional stress. When the helicopter is working close to the ground, the rotor wash of the helicopter is a safety concern by potentially causing loose vegetation, dirt, and other objects to fly through the air, which can strike or land on any person in close proximity, as well as cause decreased vision. Though rare, helicopter crashes and hard landings can, and have occurred (approximately 10 times over the last 30+ years), while conducting wild horse gathers, which necessitates the need to follow gather operations and visitor protocols at every wild horse gather

to assure the safety of all people and animals involved. Flying debris caused by a helicopter crash poses a safety concern to BLM and contractor staff, visitors, and the wild horses.

During the herding process, wild horses would try to flee if they perceive that something or someone suddenly blocks or crosses their path. Fleeing wild horses can go through wire fences, traverse unstable terrain, and go through areas they normally do not use in order to escape the perceived danger, all of which can lead them to injure people by striking or trampling them if they are in the animal's path.

Disturbances in and around the gather and holding corral have the potential to injure the BLM and contractor staff who are trying to sort, move and care for the wild horses and burros by causing them to be kicked, struck, and possibly trampled by the animals trying to flee. Such disturbances also have the potential for similar harm to the public.

The BLM is committed to allowing access by interested members of the public to the fullest possible degree without compromising safety or the success of operations. To minimize risks to the public from helicopter operations, the gather contractor is required to conduct all helicopter operations in a safe manner, and to comply with FAA regulations (FAR) 91.119 and BLM IM No. 2010-164 [5] (Appendix E). Public observations sites would also be established in locations that reduce safety risks to the public (e.g., from helicopter-related debris or from the rare helicopter crash landing, or from the potential path of gathered wild horses), to the wild horses (e.g., by ensuring observers would not be in the line of vision of wild horses being moved to the gather site) and to contractors and BLM employees who must remain focused on the gather operations and the health and well-being of the wild horses. The Public Observation Protocols found in Appendix C provide the public with the opportunity to safely observe the gather operations. Every attempt would be made to identify observation site(s) at the gather location that offers good viewing opportunities, although there may be circumstances (flat terrain, limited vegetative cover, private lands, etc.) that require viewing locations to be at greater distances from the gather site to ensure safe gather operations.

3.11 Area of Critical Environmental Concern

An Area of Critical Environmental Concern (ACEC) is defined in the Federal Land Policy and Management Act (FLPMA) (Public Law 94-579, Section 103[a]) as an area on BLM-managed lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, geologic, paleontological, or scenic values, to fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.

In November 2014, the BLM evaluated six units for ACEC designation, the 6,583 acre Churchill Narrows Buckwheat Botanical, the 137,267 acre Namazii Wunu Cultural ACEC, the 87,302 acre Pine Nut Bi-State Sage-Grouse ACEC, the 330 acre Pine Nut Mountains William Combleaf

5 At recent gathers, public observers have ranged in number from only a handful of individuals to a maximum of between 15-25 members of the public. At these numbers, BLM has determined that the current level of public visitation to gather operations falls below the threshold of an "open air assembly" under the FAR regulations. 14 CFR § 91.119.

Botanical ACEC, and the 81,752 acre Tagim Asa Cultural ACEC which partially overlap the Pine Nut Mountains (Figure 14;BLM 2014). A final determination of management actions for each ACEC unit, if designated, would be made as a part of the on-going land use plan revision. A Record of Decision is anticipated in the spring of 2017.

3.12 Lands with Wilderness Characteristics

The authority to inventory BLM-managed lands for wilderness characteristics (LWC) is found in Sections 201 and 202 of FLPMA. Manual 6320, Conducting Wilderness Characteristics Inventory on BLM Lands (BLM 2012b), allows the BLM discretion to manage lands with wilderness characteristics exclusively for protecting those characteristics, or to consider those characteristics in relation to other resource values and demands, or not manage for wilderness character. An area with wilderness characteristics may also contain other values not necessary for the determination of wilderness character. These supplemental values include the following:

- *Size*: An area must be a roadless area of 5,000 acres of contiguous BLM-managed lands, or if less than 5,000 acres, must be contiguous with BLM-managed lands that have been formally determined to have wilderness or potential wilderness values.
- *Naturalness*: Lands and resources exhibit a high degree of naturalness when affected primarily by the forces of nature and where the imprint of human activity is substantially unnoticeable.
- *Outstanding Opportunities for Solitude or Primitive and Unconfined Types of Recreation:* Visitors may have outstanding opportunities for solitude or primitive and unconfined types of recreation when the sights, sounds, and evidence of other people are rare or infrequent where visitors can be isolated, alone, or secluded from others; where the use of an area is non-motorized, non-mechanical means; and where no or minimal recreation facilities are encountered.
- *Supplemental Values*: The area may contain ecological, geological, or other features of scientific, educational, scenic, or historical values.

In 2014 the BLM inventoried public lands within the project area and identified seven individual units totaling approximately 142,000 acres that meet the criteria for wilderness character. A final determination of management actions for each LWC unit would be made as a part of the on-going land use plan revision. A Record of Decision that would establish management direction and objectives for these units meeting wilderness characteristics is anticipated in the spring of 2017. For more information see the *Report on Lands with Wilderness Characteristics* (BLM 2014b).

3.13 Cultural Resources

Cultural resources include historic and prehistoric evidence of past human activities on the land, including Native American habitation and resource procurement sites, historic mining and ranching sites, and historic architecture. Cultural resources with the potential to provide important information for scientific research or to illustrate significant parts of American history may be listed on, or be eligible for listing on, the National Register of Historic Places (NRHP). The National Historic Preservation Act of 1966, as amended (NHPA) requires federal agencies to consider the effects of federal decision-making on NRHP-listed or eligible cultural resources, which are referred to as "historic properties."

Approximately 13% of the Pine Nut HMA has been subject to cultural resources inventory, resulting in documentation of 400 cultural resources sites, of which about 10% are historic properties. Based on this sample, between 1,000 and 3,000 cultural resources sites are likely present in the HMA, including hundreds of historic properties. Cultural resources in the Pine Nut HMA include evidence of Native American hunting, plant gathering, tool making, and habitation over the past 10,000 years. Cultural resources related to historic mining, ranching, charcoal-making, and settlement over the past 150 years are also present across the HMA. Most cultural resources in this area are archaeological sites (as opposed to architecture) and their eligibility for the NRHP is based on their potential to contribute to our understanding of history and prehistory through scientific research. This scientific value can be adversely impacted by disturbance to soils through hoof action, loss of vegetation cover, and subsequent erosion.

4.0 Environmental Consequences

This chapter describes and compares the environmental consequences predicted to result from implementing the Proposed Action or Alternatives described in Chapter 2.0. The purpose of this chapter is to present the impact analysis of the alternatives and to disclose the impacts of the actions on affected resources by the Proposed Action or Alternatives.

The potential consequences or impacts of each alternative are addressed in the same order of resource topics in Chapter 3.0. This parallel organization allows readers to compare existing resource conditions (Chapter 3.0) with potential impacts (Chapter 4.0).

Types of Effects
This chapter describes the potential direct, indirect, and residual effects to resources that may result from the Proposed Action or Alternatives, as well as identifies the potential monitoring needs associated with the specific resources. In this document, the word "adverse" is used in characterizing minor (non-significant) detrimental effects to a resource, and "negligible" is used in characterizing minor (non-significant) detrimental effects to a resource that are generally undetectable. "Beneficial" effects would have a positive effect on the resource. In this document, the terms "effect" and "impact" are used synonymously. Assessment of effects can be for short-term (generally considered during Project implementation) or the long-term. Effects fall into two categories, direct (caused by the action, same time and place) and indirect (caused by the action, but later in time or further in distance).

4.1 Wild Horse Management

4.1.0 Wild Horse Management – Population Modeling by Alternative

Population modeling was completed to analyze the potential outcome from the Proposed Action and action alternatives on wild horse populations in the HMA. Table 12 compares the Proposed Action to all other alternatives for the HMA. See Appendix C for complete modeling results.

The WinEquus population model is designed to provide insight on how wild horse populations would likely respond to different management alternatives. The program runs 100 simulations for each management alternative, the averages from the 100 simulations are in table 16, see Appendix H for the complete modeling results. The results show the lowest trial and highest

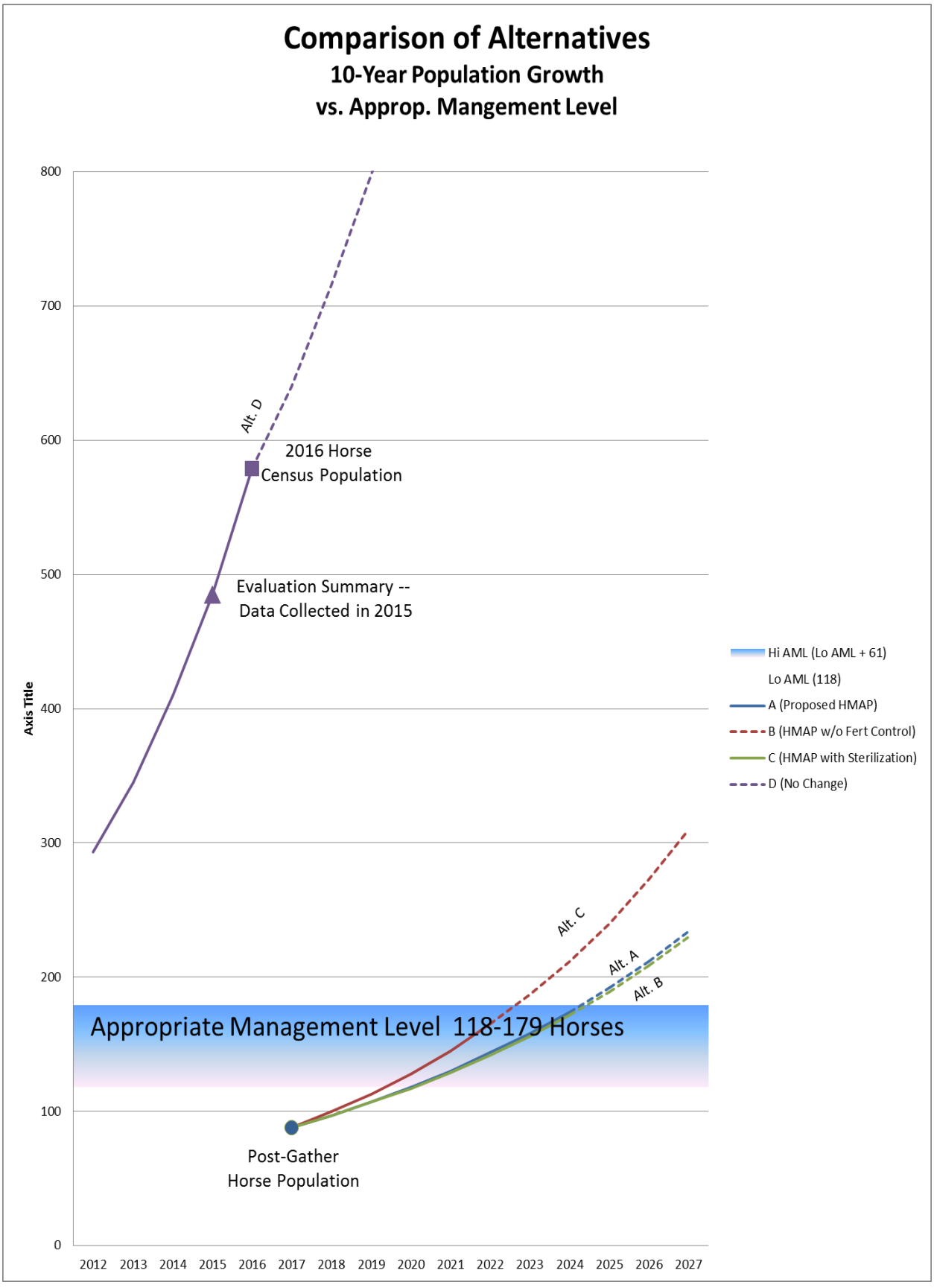
trial which represent the lowest and highest number from the 100 simulations, The results also show the median trial which is displayed in table 16. The tables in Appendix C show the 10^{th}, 25^{th}, 75^{th} and 90^{th} percentile. Each percentile indicates the number of simulations that fall below it. As an example if the table showed that 860 horses gathered were in the 10^{th} percentile that would indicate that in 10 percent of the simulations less than 860 horses were gathered. If the table showed 1,059 horses gathered in the 90^{th} percentile that would indicate that in 90 percent of the simulations less than 1,059 horses were gathered.

The population would be expected to increase at a lower rate if contraceptives or spaying is used. The use of contraceptives or spaying would have several notable benefits, fewer horses would be born which would result in fewer excess horses that would need to be removed and cared for and the gather interval may be increased as it would take longer for the horse population to build back to a level that is detrimental to the resources. Additionally a lower rate of increase would result in lower use on resources for a longer period of time allowing the native vegetation more time to recover in areas that are currently over grazed, decreasing the need to adjust the AML to a lower level in the future.

Table 12. WinEquus Population Modeling Results by Alternative.

Alternative	Average Growth Rate Over 10-Years	Population	Number Treated	Number Gathered	Number Removed
A	8.8%	234	50	936	680
B	13.9%	310	N/A	1,004	864
C	8.2%	230	68	944	684
D	20.1%	1,899	N/A	N/A	N/A

Source: WinEquus version 3.2.


Comparison of Alternatives
10-Year Population Growth
vs. Approp. Mangement Level
Axis Title
800
700
600
500
400
300
200
100
0
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
Alt. D
2016 Horse
Census Population
Evaluation Summary --
Data Collected in 2015
Alt. C
Alt. A
Alt. B
Appropriate Management Level 118-179 Horses
Post-Gather
Horse Population
Hi AML (Lo AML + 61)
Lo AML (118)
A (Proposed HMAP)
B (HMAP w/o Fert Control)
C (HMAP with Sterilization)
D (No Change)

4.1.1 Wild Horse Management – Alternative A (proposed Herd Management Area Plan)

Wild Horse Response to Handling
Impacts to individual animals may occur as a result of stress associated with the gathering, processing and transportation of the animals. The intensity of these impacts varies by individual animal, and can be indicated by behavior ranging from nervous agitation to physical distress. Other impacts can occur from separation from the main herd. Generally wild horses acclimate to the holding corrals quickly. Indirect impacts to individuals may include spontaneous abortions in mares, and increased social displacement and conflict between stallions. Brief skirmishes can occur between stallions following sorting. Traumatic injuries rarely occur. Typical injuries that could occur during the skirmishes generally result from: kicks and bites, typically without breaking the skin.

Foals are occasionally gathered that were previously orphaned. They can be in poor health and would receive all necessary treatment, typically specifically designed food and feedings as needed. Since the proposed gathers would take place mid-winter, and any gathered foals would likely have been weaned by their mother pre-weaned orphaned foals are not expected.

Sorting and Transporting of Wild Horses
Most injuries occur once wild horses have been herded and typically occur within the trap sites, holding corrals, during transportation between the facilities, or while being sorted. Injuries that could occur range from kicks and bites from other wild horses, to nicks from contact with corral panels or gates. Sorting and transportation is handled as quickly as possible to minimize fighting between the horses. During the capture and sorting process, animals are examined for health, injuries or other defects. Any decision to euthanize an animal would be consistent with BLM IM 2015-070 (Animal Health, Maintenance, Evaluation and Response Policy) and methods endorsed by the American Veterinary Medical Association. Wild horses that could be euthanized for non-gather related reasons include, but are not limited to: animals with previous injuries (broken hip, leg), animals with few remaining teeth, animals in poor physical condition, and animals with serious physical defects (club foot).

Water/Bait Trapping (if used)
Bait and/or water trapping generally requires long time frames. To be effective traps need to be constructed in areas frequented by horses during times when water or food is limited. Generally, it takes days or weeks before horses acclimate to the trap and/or decide to access the water/bait. Because of the poor road access to most of the water sources inside and outside of the Pine Nut HMA very limited trapping opportunities exist.

Trapping involves setting up portable panels around an existing water source or in an active wild horse area. The portable panels would be set up to allow wild horses to move freely in and out of the corral until they have adjusted to it. When the wild horses fully acclimate to the corral, it is fitted with a gate system. During this acclimation period the horses would experience some stress due to the panels being setup and perceived access restriction to the water/bait source.

Often it is necessary to fence off other water sources in the area as horses are more inclined to utilize unfenced water sources.

When actively trapping excess wild horses, the trap would be checked daily. Horses would be either removed immediately or fed and watered for up to several days prior to transport to a holding facility. Existing roads would be used to access the trap sites.

Gathering excess horses utilizing bait/water trapping could occur at any time of the year and extend until the target number of animals is removed in order to achieve management objectives including: attaining AML, implement population control measures, and removing animals residing outside the HMA. Generally, bait/water trapping is most effective and is only appropriate when a specific resource is limited, such as food or water. Because bait and water trapping does not involve horses moving any distance it can occur any time of the year.

Wild Horses Released Back into the HMA

Direct effects to wild horse populations as a result of the gathers include: altered herd population dynamics; altered age structure and/or sex ratio; reduced numbers and in instances where PZP-22 (or other contraceptive technique) is used, lower population growth rates. Reducing the number of animals would improve range health and reduce the possibility that the excess number of wild horses would result in some animals experiencing starvation or terminal dehydration due to insufficient forage and/or water. There would be decreased competition with wildlife and livestock for forage and water. Reducing the wild horse population to within AML would also reduce the likelihood that the animals move outside the HMA onto lands not managed for wild horses. A thriving natural ecological balance would be maintained or restored throughout the gather area. Improved herd conditions would likely result in higher foal survival rates, which may be mitigated by applying contraceptives or other fertility control methods.

Herd dynamics would be expected to normalize within weeks of the animals being returned to the HMA. Wild horse populations would be expected to remain within the AML range for three to five years. If PZP-22 (or other contraceptive) is applied to mares that treatment may further extend the timeframe that the population remains within AML.

Transport, Short-Term Holding, and Adoption Preparation

Wild horses removed from the range would be transported to a short-term holding facility using trucks with stock trailers. Animals would be segregated by sex and age, and loaded into separate compartments. Although transportation time for wild horses is limited to no more than 12 hours, actual transport time from the gather area to a short-term holding facility is expected to be much less (generally less than two hours if the destination is Palomino Valley, Nevada). During transport, potential impacts to individual wild horses can include stress, slipping, falling, being kicked or bitten, or stepped on by another animal. However, these impacts are reduced by insuring the trailer floors are covered with non-skid material, separating horses by sex, age, and smaller or weaker animals.

Upon arrival at the short-term holding facility, the wild horses would be off-loaded and placed into holding pens where they are provided water and hay. A veterinarian would provide care and make any recommendation for an animal that would need to be euthanized.

After some time of adjustment to the short-term holding facility, the animals would be prepared for adoption. Preparation includes freeze-marking with a unique identification number, vaccination for common diseases, castration of studs, and de-worming. Potential impacts during adoption preparation would be similar to those that can occur during transport. A minimum of 700 square feet per animal is provided at the facility. Mortality averages approximately five percent (GAO 2008) including animals euthanized from pre-gather condition, animals unable to transition to feed, and animals which die accidentally during sorting, handling or preparation.

Adoption

Applicants who wish to adopt a wild horse must have at least 400 square foot corral with panels that are at least six feet tall. Applicants are required to provide adequate shelter, feed and water. The BLM retains title to the horse for a minimum of one year, and can conduct inspections. After one year, the applicant may take title to the horse at which point the animal become the property of the applicant. Adoptions are conducted in accordance with 43 CFR 4750.

Sale with Limitation

A buyer must fill out an application and be pre-approved before they may purchase a wild horse. A sale-eligible animal is one that is more than 10 years old or has been offered unsuccessfully for adoption at least three times. The application specifies that all buyers may not sell wild horses to slaughter houses or to anyone who would sell the animal to a commercial processing plant. Sales of wild horses are conducted in accordance with the WFRHBA and any congressional limitations.

Long-Term Grassland Pastures

Potential impacts to individual wild horses from transportation to long-term pastures are similar to those impacts previously discussed for transportation to short-term pastures. One difference is that when being transported to long-term pastures, animals may be transported for up to 24 hours, at which time they are off-loaded and provided eight hours of on-the-ground rest. During the rest period, each animal is provided water and hay.

Long-term pastures are designed to provide excess wild horses with humane, life-long care in a natural setting. The pastures are large enough in size (privately owned lands ranging in size from 1,100 to 46,000 acres) to allow free-roaming behavior with forage, water and shelter to sustain them in good condition. Mares and castrated stallions are segregated into separate pastures. Foals are born only to those mares recently gathered from the western public lands. When those foals are weaned at about eight to 10 months, they are then shipped to short-term holding facilities to be prepared and made available for adoption. A very small number of animals may be euthanized if their body condition is 3 or lower due to age and other factors.

Although most wild horses residing on long-term pastures live longer than average, natural mortality averages approximately eight percent per year (GAO 2008).

Euthanasia or Sale Without Limitation
While euthanasia and sale without limitation are allowed under the WFRHBA, these activities are not permitted by BLM policy and current Congressional appropriations limitations.

Maintain Genetic Diversity
By maintaining genetic diversity problems associated with inbreeding will be avoided. Hair samples would be collected from horses captured while they are restrained in a portable chute while they are being aged. Collecting hair samples would require the animal to be restrained for less than an additional minute. Hair samples are usually collected by rapping a wood dowel or similar object around approximately ten hairs and pulling them out, which may result in a small announce but the horses quickly recover.

The hair samples would be analyzed by Dr. Gus Cothran, at Texas A&M University and his recommendations would be followed. When analysis indicates low diversity a few young horses from other HMAs or areas outside of the HMA would be released along with animals identified for release back into the HMA. Some stress would occur as these "new" animals assimilate into new bands, however, it would be relatively short in duration.

Assuring Rangeland Health
By limiting utilization to levels to that which will allow the native vegetation to recover and meet sage-grouse objectives upland communities will not only provide quality habitat for wild horses but also native wildlife. The horses would benefit from restoring and maintaining the rangeland as would wildlife as their habitat components would be met.

Riparian areas at PFC will not be negatively impacted by soil compaction caused by excessive use and the flow rates may eventually increase. Critical habitat will be restored for many species of native wildlife.

Population Control Measures
BLMs Use of Contraception in Wild Horse Management
Expanding the use of population growth suppression (PGS) to slow population growth rates and reduce the number of animals removed from the range and sent to off-range pastures (ORPs) is a BLM priority. The WFRHBA of 1971 specifically provides for contraception and sterilization (section 3.b.1). No finding of excess animals is required for BLM to pursue contraception in wild horses or wild burros. Contraception has been shown to be a cost-effective and humane treatment to slow increases in wild horse populations or, when used with other techniques, to reduce horse population size (Bartholow, 2004; de Seve and Boyles-Griffin, 2013). All fertility control methods in wild animals are associated with potential risks and benefits, including effects of handling, frequency of handling, physiological effects, behavioral effects, and reduced

population growth rates (Hampton et al. 2015). Contraception by itself does not remove excess horses from an HMA's population, so if a wild horse population is in excess of AML, then contraception alone would result in some continuing environmental effects of horse overpopulation. Successful contraception reduces future reproduction. Limiting future population increases of horses would limit increases in environmental damage from higher densities of horses. Horses are long-lived, potentially reaching 20 years of age or more in the wild and, if the population is above AML, treated horses returned to the HMA may continue exerting negative environmental effects throughout their life span. In contrast, if horses above AML are removed when horses are gathered, that leads to an immediate decrease in the severity of ongoing detrimental environmental effects.

Successful contraception would be expected to reduce the frequency of horse gather activities on the environment, as well as wild horse management costs to taxpayers. Bartholow (2007) concluded that the application of 2 or 3-year contraceptives to wild mares could reduce operational costs in a project area by 12-20%, or up to 30% in carefully planned population management programs. He also concluded that contraceptive treatment would likely reduce the number of horses that must be removed in total, with attendant cost reductions in the number of adoptions and total holding costs.

If application of contraception to horses requires capturing and handling horses, the risks and costs associated with capture and handling of horses may be comparable to those of gathering for removal, but with expectedly lower adoption and long-term holding costs. Selectively applying contraception to older rebound animals and returning them to the HMA could reduce long-term holding costs for such horses, which are difficult to adopt, and could negate the compensatory reproduction that often follows removals (Kirkpatrick and Turner 1991).

Porcine Zona Pellucida (PZP) Vaccine

The BLM currently uses two PZP formulations for fertility control of wild horse mares, ZonaStat-H and PZP-22. As other formulations approved for use by BLM, they may be applied through future gathers or darting activities. PZP vaccine use in wild horse herds has been studied extensively for more than two decades, with papers published in peer-reviewed scientific journals by experienced reproductive physiologists, equine scientists, wildlife biologists, geneticists, and animal behaviorists.

The most effective is a one- year liquid vaccine that must be boostered annually through hand injection or remote darting. This vaccine, known as ZonaStat-H, was registered in February 2012 with the EPA for preventing pregnancy in wild horse mares. Developed in collaboration with Dr. Jay F. Kirkpatrick, Director of the Science and Conservation Center in Billings, MT, ZonaStat-H is based on PZP, a protein which when injected, produces antigens that bind the sperm receptor sites and render the animal infertile. http://www.pzpinfo.org/pzp.html http://www.humanesociety.org/news/press_releases/2012/02/EPA_Announces_First_Fertility_Control_ Vaccine_for_Wild_Horses.html

The PZP vaccine is currently being used on over 75 areas managed for wild horses by the National Park Service, US Forest Service, and the Bureau of Land Management and its use is

appropriate for free-ranging wild horse herds. Taking into consideration available literature on the subject, National Research Council concluded in their 2013 report that PZP was one of the most preferable available methods for contraception in wild horses and burros (NRC, 2013). The long-term goal of PZP use is to reduce or eliminate the need for gathers and removals (Turner et al. 1997). The immune-contraceptive Porcine Zona Pellucida (PZP) vaccine meets most of the criteria that the National Research Council (2013) used to identify the most promising fertility control methods, in terms of delivery method, availability, efficacy, and side effects. It has been used extensively in wild horses (NRC 2013), and in a population of feral burros in territory of the US (Turner et al. 1996). PZP is relatively inexpensive, meets BLM requirements for safety to mares and the environment, and is commercially produced as ZonaStat-H, an EPA-registered product (EPA, 2012; SCC 2015). It can easily be remotely administered in the field in cases where mares are relatively approachable.

Under the Proposed Action, the BLM would return to the HMA as needed to re-apply PZP-22 and / or ZonaStat-H and initiate new treatments in order to maintain contraceptive effectiveness in controlling population growth rates. Both forms of PZP can safely be reapplied as necessary to control the population growth rate. Even with repeated booster treatments of PZP, it is expected that most, if not all, mares would return to fertility. Once the population is at AML and population growth seems to be stabilized, BLM could use population planning software (WinEquus II, currently in development by USGS Fort Collins Science Center) to determine the required frequency of re-treating mares with PZP.

PZP Direct Effects

When injected as an antigen in vaccines, PZP causes the mare's immune system to produce antibodies that are specific to zona pellucida proteins on the surface of that mare's eggs. The antibodies bind to the mare's eggs surface proteins (Liu et al., 1989), and effectively block sperm binding and fertilization (Zoo Montana, 2000). Because treated mares do not become pregnant but other ovarian functions remain generally unchanged, PZP can cause a mare to continue having regular estrus cycles throughout the breeding season. Research has demonstrated that contraceptive efficacy of an injected PZP vaccine is approximately 90% for mares treated twice in the first year and boostered annually (Kirkpatrick et al., 1992). In addition, among mares, PZP contraception appears to be reversible, with most treated mares returning to fertility over time. PZP vaccine application at the capture site does not appear to affect normal development of the fetus, hormone health of the mare or behavioral responses to stallions, should the mare already be pregnant when vaccinated (Kirkpatrick et al., 1995). The vaccine has no apparent effect on pregnancies in progress or the health of offspring (Turner et al., 1997).

The NRC (2013) criterion by which PZP is not a good choice for wild horse contraception was duration. The ZonaStat-H formulation of the vaccine tends to confer only one year of efficacy. Some studies have found that a PZP vaccine in long-lasting pellets (PZP-22) can confer multiple years of contraception (Turner et al., 2007), particularly when boostered with subsequent PZP vaccination (Rutberg et al., In Press). Other trial data, though, indicate that the pelleted vaccine may only be effective for one year (J. Turner, University of Toledo, Personal Communication).

Following a gather, application of PZP for fertility control would reduce fertility in a large

percentage of mares for at least one year (Ransom et al., 2011). Recruitment of foals into the population may be reduced over a three- year period. Gather efficiency would likely not exceed 85% via helicopter, and may be less with bait and water trapping, so there would be a portion of the female population uncaptured that is not treated in any given year. Additionally, not all mares respond to the fertility control vaccine, but instead continue to foal normally.

In most cases, PZP contraception appears to be temporary and reversible (Kirkpatrick and Turner, 2002; Joonè et al. 2016), does not appear to cause out-of-season births (Kirkpatrick and Turner, 2003), and has no ill effects on ovarian function if contraception is not repeated for more than five consecutive years on a given mare. Although the rate of long-term or permanent sterility following repeated vaccinations with PZP has not been quantified, it must be acknowledged that this could be a result for some number of wild horses receiving multiple repeat PZP vaccinations. Repeated treatment with PZP may or may not lead to direct effects on ovaries. Bechert et al. (2013) found that ovarian function was affected by the SpayVac PZP vaccination, but that there were no effects on other organ systems. Joonè et al. (2016) found effects on ovaries after PZP vaccination in some treated mares, but normal estrus cycling had resumed 10 months after the last treatment. SpayVac is a patented formulation of PZP in liposomes that BLM does not use to treat animals at this time. Kirkpatrick et al (1992) noted effects on ovaries after three years of treatment with PZP. Observations at Assateague Island National Seashore indicate that the more times a mare is consecutively treated, the longer the time lag before fertility returns, but that even mares treated 7 consecutive years did return to ovulation (Kirkpatrick and Turner, 2002). Other studies have reported that continued applications of PZP may result in decreased estrogen levels (Kirkpatrick et al., 1992) but that decrease was not biologically significant, as ovulation remained similar between treated and untreated mares (Powell & Monfort, 2001). Permanent sterility for mares treated consecutively 5-7 years was observed by Nunez et al. (2010). In a graduate thesis, Knight (2014) suggested that repeated treatment with as few as three to four years of PZP treatment may lead to longer-term sterility, and that sterility may result from PZP treatment before puberty.

If a mare is already pregnant, the PZP vaccine has not been shown to affect normal development of the fetus or foal, or the hormonal health of the mare with relation to pregnancy. In mice, Sacco et al. (1981) found that antibodies specific to PZP can pass from mother mouse to pup via the placenta or colostrum, but that did not apparently cause any innate immune response in the offspring: the level of those antibodies were undetectable by 116 days after birth. There was no indication in that study that the fertility or ovarian function of those pups was compromised, nor is BLM aware of any such results in horses or burros.

On-range observations from 20 years of application to wild horses indicate that PZP application in wild mares does not generally cause mares to foal out of season or late in the year (Kirkpatrick and Turner 2003). Nunez's (2010) research showed that a small number of mares that had been previously been treated with PZP foaled later than untreated mares and expressed the concern that this late foaling "may" impact foal survivorship and decrease band stability. However, the paper provided no evidence that such impacts actually occurred. Ransom et al. (2013), though, identified a potential shift in reproductive timing as a possible drawback to prolonged treatment with PZP. Ransom et al. (2013) stated that the treated mares in his study areas foaled over a 341 day period, however, the researcher's findings showed that over 81% of the documented births in

this study were between March 1 and June 21, i.e., within the normal spring season. Ransom et al. (2013) advised that managers should consider carefully before using PZP in small refugia or rare species. Wild horses and burros in Nevada do not generally occur in isolated refugia, and they are not a rare species. Moreover, an effect of shifting birth phenology was not observed uniformly: in two of three PZP-treated wild horse populations studied by Ransom et al. (2013), foaling season of treated mares extended three weeks and 3.5 months, respectively, beyond that of untreated mares. In the other population, the treated mares foaled within the same time period as the untreated mares. Moreover, Ransom et al. (2013) found no negative impacts on foal survival even with an extended birthing season.

Mares receiving the vaccine would experience slightly increased stress levels associated with handling while being vaccinated and freeze-marked. Newly captured mares that do not have markings associated with previous fertility control treatments would be marked with a new freeze-mark for the purpose of identifying that mare, and identifying her PZP vaccine treatment history. This information would also be used to determine the number of mares captured that were not previously treated, and could provide additional insight regarding gather efficiency.

Most mares recover from the stress of capture and handling quickly once released back to the HMA, and none are expected to suffer serious long term effects from the fertility control injections, other than the direct consequence of becoming temporarily infertile. Injection site reactions associated with fertility control treatments are possible in treated mares (Roelle and Ransom 2009), but swelling or local reactions at the injection site are expected to be minor in nature. Roelle and Ransom (2009) found that the most time-efficient method for applying PZP is by hand-delivered injection of 2-year pellets when horses are gathered. They observed only two instances of swelling from that technique. Use of remotely delivered, 1-year PZP is generally limited to populations where individual animals can be accurately identified and repeatedly approached. The dart-delivered formulation produced injection-site reactions of varying intensity, though none of the observed reactions appeared debilitating to the animals (Roelle and Ransom 2009). Joonè et al. (2016) found that injection site reactions had healed in most mares within 3 months after the booster dose, and that they did not affect movement or cause fever. The longer term nodules observed did not appear to change any animal's range of movement or locomotor patterns and in most cases did not appear to differ in magnitude from naturally occurring injuries or scars.

Indirect Effects

One expected long-term, indirect effect on wild horses treated with fertility control would be an improvement in their overall health. Many treated mares would not experience the biological stress of reproduction, foaling and lactation as frequently as untreated mares, and their better health is expected to be reflected in higher body condition scores. After a treated mare returns to fertility, her future foals would be expected to be healthier overall, and would benefit from improved nutritional quality in the mares' milk. This is particularly to be expected if there is an improvement in rangeland forage quality at the same time, due to reduced wild horse population size. Past application of fertility control has shown that mares' overall health and body condition remains improved even after fertility resumes. Observations of mares treated in past gathers showed that many of the treated mares were larger than, maintained higher body condition than,

and had larger healthy foals than untreated mares. Following resumption of fertility, the proportion of mares that conceive and foal could be increased due to their increased fitness; this has been called a 'rebound effect.' More research is needed to document and quantify these hypothesized effects; however, it is believed that repeated contraceptive treatment may minimize this rebound effect.

Because successful fertility control would reduce foaling rates and population growth rates, another indirect effect would be to reduce the number of wild horses that have to be removed over time to achieve and maintain the established AML. Also, reducing the numbers of wild horses that would have to be removed in future gathers could allow for removal of younger, more easily adoptable excess wild horses, and thereby could eliminate the need to send additional excess horses from this area to long term pastures (LTPs). A high level of physical health and future reproductive success of fertile mares within the herd would be sustained, as reduced population sizes would lead to more availability of water and forage resources per capita.

Reduced population growth rates and smaller population sizes would also allow for continued and increased environmental improvements to range conditions within the project area, which would have long-term benefits to wild horse habitat quality. As the population nears or is maintained at the level necessary to achieve a thriving natural ecological balance, vegetation resources would be expected to recover, improving the forage available to wild horses and wildlife throughout HMA. With a better ecological balance, and more optimum distribution of wild horses across the HMA, there would also be less trailing and concentrated use of water sources, which would have many benefits to the wild horses. There would be reduced competition among wild horses using the water sources, and less fighting would occur among studs and individual animals accessing water sources. Water quality and quantity would continue to improve to the benefit of all rangeland users including wild horses. Wild horses would also have to travel less distance back and forth between water and desirable foraging areas. Should PZP booster treatment and repeated fertility control treatment continue into the future, the chronic cycle of overpopulation and large gathers and removals would no longer occur, but instead a consistent cycle of balance and stability would ensue, resulting in continued improvement of overall habitat conditions and animal health.

Behavioral Effects

The NRC report (2013) noted that all fertility suppression has effects on mare behavior, mostly as a result of the lack of pregnancy and foaling, and concluded that PZP was a good choice for use in the program. The result that PZP-treated mares may continue estrus cycles throughout the breeding season can lead to behavioral differences, when compared to mares that are fertile. This type of behavioral difference should be considered as potential consequences of successful contraception.

Ransom et al. (2010) found no differences in how PZP-treated and untreated mares allocated their time between feeding, resting, travel, maintenance, and social behaviors in three populations of wild horses, which is consistent with Powell's (1999) findings in another population. Likewise, body condition of PZP-treated and control mares did not differ between

treatment groups in Ransom et al.'s (2010) study. Turner and Kirkpatrick (2002) and Nunez (2009, 2010) found that PZP-treated mares had higher body condition than control mares in another population, presumably because energy expenditure was reduced by the absence of pregnancy and lactation. Knight (2014) found that PZP-treated mares had better body condition, lived longer and switched harems more frequently, while mares that foaled spent more time concentrating on grazing and lactation and had lower overall body condition. Kirkpatrick's work on Assateague Island shows that once fillies (female foals) that were born to mares treated with PZP during pregnancy eventually breed, they produce healthy, viable foals.

In two studies involving a total of four wild horse populations, both Nunez et al. (2009, 2010) and Ransom et al. (2010) found that PZP-treated mares were involved in reproductive interactions with stallions more often than control mares, which is not surprising given the evidence that PZP-treated females of other mammal species can regularly demonstrate estrus behavior while contracepted (Shumake and Wilhelm 1995, Heilmann et al. 1998, Curtis et al. 2002).

Ransom et al. (2010) found that control mares were herded by stallions more frequently than PZP- treated mares, and Nunez et al. (2009, 2010) found that PZP-treated mares exhibited higher infidelity to their band stallion during the non-breeding season than control mares. Madosky et al. (2010) and Knight (2014) found this infidelity was also evident during the breeding season in the same population that Nunez et al. (2009, 2010) studied; they concluded that PZP-treated mares changing bands more frequently than control mares could lead to band instability. Knight (2014) suggested that there may be short-term stress for individuals that switch between bands, as measured by fecal cortisol levels. The research is inconclusive as to whether all the mares' movements between bands were related to the PZP treatments or the fact that they are not nursing a foal. At the population level, available research does not provide evidence of the loss of harem structure among herds treated with PZP. Long-term implications of these changes in social behavior are currently unknown, but no negative impacts on the overall animals or populations welfare or well-being have been noted in these studies.

The National Research Council's 2013 report titled *Using Science to Improve the BLM Wild Horse and Burro Program* ("NRC Report") found that harem changing was not likely to result in serious adverse effects for treated mares:

> "The studies on Shackleford Banks (Nuñez et al., 2009; Madosky et al., 2010) suggest that there is an interaction between pregnancy and social cohesion. The importance of harem stability to mare well-being is not clear, but *considering the relatively large number of free-ranging mares that have been treated with liquid PZP in a variety of ecological settings, the likelihood of serious adverse effects seem low*."

Nunez (2010) stated that not all populations will respond similarly to PZP treatment. Differences in habitat, resource availability, and demography among conspecific populations will undoubtedly affect their physiological and behavioral responses to PZP contraception, and need to be considered. Kirkpatrick et al. (2010) concluded that "*the larger question is, even if subtle alterations in behavior may occur, this is still far better than the alternative,"* and that the *"…other victory for horses is that every mare prevented from being removed, by virtue of contraception, is a mare that will only be delaying her reproduction rather than being eliminated*

permanently from the range. This preserves herd genetics, while gathers and adoption do not."

The NRC Report (2013) provides a comprehensive review of the literature on the behavioral effects of contraception that puts Dr. Nuñez's (2009, 2010) research into the broader context of all of the available scientific literature, and cautions, based on its extensive review of the literature that:

> ". . . in no case can the committee conclude from the published research that the behavior differences observed are due to a particular compound rather than to the fact that treated animals had no offspring during the study. That must be borne in mind particularly in interpreting long-term impacts of contraception (e.g., repeated years of reproductive "failure" due to contraception)."

Genetic Effects

In large populations of wild horses that have recent and ongoing influx of breeding animals from other populations, contraception is not expected to cause an unacceptable loss of genetic diversity. In any diploid population, the loss of genetic diversity through inbreeding or drift can be prevented by large effective breeding population sizes (Wright 1931) or by introducing new potential breeding animals (Mills and Allendorf 1996). The NRC report recommended that managed herds of wild horses would be better viewed as components of interacting metapopulations, with the potential for interchange of individuals and genes taking place as a result of natural and human-facilitated movements. In the last 10 years, there has been a high realized growth rate of wild horses in most areas administered by the BLM, such that most alleles that are present in any given mare are likely to already be well represented in her siblings, cousins, and more distant relatives. With the exception of horses in a small number of well-known HMAs that contain alleles associated with old Spanish horse breeds (NRC 2013), the genetic composition of wild horses in lands administered by the BLM is consistent with admixtures from domestic breeds. As a result, in most HMAs, applying fertility control to a subset of mares is not expected to cause irreparable loss of genetic diversity. Improved longevity is an expected result of contraceptive treatment that can provide for lengthening generation time; this result which would be expected to slow the rate of genetic diversity loss (Hailer et al., 2006).

Gather, Remove Excess Wild Horses to the Low AML for Certain Grazing Allotments within the HMA, Apply Population Control Treatments.

The Proposed Action would permanently remove approximately 500 wild horses during initial actions including: 276 wild horses within the HMA and 222 wild horses outside the HMA. All 2016 foals, which would be between six to nine months of age at the time of this gather, would be removed as "weaned foals." Any dependent foals less than six months of age would be either removed or released with its mare depending on the final disposition of the mare. The gather would occur no earlier than January 2017, and would take between 7 and 10 days to be completed. The BLM would also attempt to gather a sufficient number beyond the excess wild horses to be removed from the HMA, to allow for the application of fertility control to all mares to be re-released.

Excess wild horses would be removed using a selective removal strategy as follows:

a) first priority: age class – 6 years and younger;
b) second priority – age class – 11 to 19 years;
c) third priority – age class – 7 to 10 years; and
d) fourth priority – age class – 20 years and older would not be removed from the HMA unless specific exceptions prevent them from being returned to the range.

Due to the mountainous terrain and vegetative cover (timber), gather efficiency may be less than optimal. Gather efficiencies typically averages approximately 80 percent, so it is likely that all wild horses that are accessible and can be located would need to be gathered in order to achieve the Proposed Action. Wild horse numbers within the HMAs would be reduced to the low range of AML by allotment.

Herd health and characteristics data would be collected as a part of continued monitoring of the wild horse herds. Other data, including sex and age distribution, condition class information (using the Henneke rating system), color, size and other information may also be recorded for all gathered wild horses. Genetic data would be collected to compare with previously collected data and to monitor genetic health of the wild horses.

Capturing of Wild Horses

Impacts to individual animals could occur as a result of stress associated with the gather, capture, processing, and transportation of animals. The intensity of these impacts would vary by individual and would be indicated by behaviors ranging from nervous agitation to physical distress. Mortality of individual horses from these activities is rare but can occur. Other impacts to individual wild horses include separation of members of individual bands and removal of animals from the population.

Indirect impacts can occur to horses after the initial stress event and could include increased social displacement or increased conflict between studs. These impacts are known to occur intermittently during wild horse gather operations. Traumatic injuries could occur and typically involve biting and /or kicking bruises. Horses may potentially strike or kick gates, panels or the working chute while in corrals or trap which may cause injuries. Lowered competition for forage and water resources would reduce stress and fighting for limited resources (water and forage) and promote healthier animals.

Indirect individual impacts are those impacts which occur to individual wild horses after the initial stress event, and may include spontaneous abortions in mares. These impacts, like direct individual impacts, are known to occur intermittently during wild horse gather operations. An example of an indirect individual impact would be the brief skirmish which occurs among studs following sorting and release into the stud pen, which lasts less than a few minutes and ends when one stud retreats. Traumatic injuries usually do not result from these conflicts. These injuries typically involve a bite and/or kicking with bruises which don't break the skin. Like direct individual impacts, the frequency of occurrence of these impacts among a population varies with the individual animal.

Spontaneous abortion events among pregnant mares following capture is also rare, though poor body condition at time of gather can increase the incidence of spontaneous abortions. Given the two different capture methods proposed, spontaneous abortion is not considered to be an issue for either of the two proposed project, since helicopter/drive trap method would not be utilized during peak foaling season (March 1 thru June 30), unless an emergency exists, and the water/bait trapping method is anticipated to be low stress.

Foals are occasionally gathered that were orphaned on the range (prior to the gather) because the mother rejected it or died. These foals are usually in poor, unthrifty condition. Orphans encountered during gathers are cared for promptly and rarely die or have to be euthanized. It is unlikely that orphan foals would be encountered since the majority of the foals would be old enough to travel with the groups of wild horses. Also depending on the time of year the current foal crop would be six to nine months of age and may have already been weaned by their mothers.

Gathering wild horses during the summer months can potentially cause heat stress. Gathering wild horses during the fall/winter months reduces risk of heat stress, although this can occur during any gather, especially in older or weaker animals. Adherence to the SOPs and techniques used by the gather contractor or BLM staff will help minimize the risks of heat stress. Heat stress does not occur often, but if it does, death can result. Most temperature related issues during a gather can be mitigated by adjusting daily gather times to avoid the extreme hot or cold periods of the day. The BLM and the contractor would be pro-active in controlling dust in and around the holding facility and the gather corrals to limit the horses' exposure to dust.

The BLM has been gathering excess wild horses from public lands since 1975, and has been using helicopters for such gathers since the late 1970's. Refer to Appendix A for information on the methods that are utilized to reduce injury or stress to wild horses and burros during gathers. Since 2006, BLM Nevada has gathered over 38,500 excess animals. Of these, gather related mortality has averaged only 0.5%, which is very low when handling wild animals. Another 0.6% of the animals captured were humanely euthanized due to pre-existing conditions and in accordance with BLM policy. This data affirms that the use of helicopters and motorized vehicles are a safe, humane, effective and practical means for gathering and removing excess wild horses and burros from the range. BLM policy prohibits gathering wild horses with a helicopter (unless under emergency conditions) during the period of March 1 to June 30 which includes and covers the six weeks that precede and follow the peak of foaling period (mid-April to mid-May).

Through the capture and sorting process, wild horses are examined for health, injury and other defects. Decisions to humanely euthanize animals in field situations would be made in conformance with BLM policy. BLM Euthanasia Policy IM 2015-070 is used as a guide to determine if animals meet the criteria and should be euthanized. Animals that are euthanized for non-gather related reasons include those with old injuries (broken hip, leg) that have caused the animal to suffer from pain or which prevent them from being able to travel or maintain body condition: old animals that have lived a successful life on the range, but now

have few teeth remaining, are in poor body condition, or are weak from old age; and wild horses that have congenital (genetic) or serious physical defects such as club foot, or sway back and should not be returned to the range.

4.1.2 Wild Horse Management – Alternative B (HMAP without Fertility Control)

This alternative is similar to the Proposed Action (proposed HMAP), with the exception that the BLM would not treat any mares with fertility control. All excess wild horses residing inside and outside the HMA would be gathered and removed (approximately 500 animals). Once a sufficient number of wild horses have been removed from within the HMA to achieve low AML, this portion of the gather operations would conclude. The BLM would not apply a fertility control. Impacts would be similar to Alternative A, except that contraceptives would not be administered, which would result in more excess wild horses and the need for shorter gather intervals as AMLs would be exceeded more quickly. The vegetation resources may not respond as quickly as in Alternative A, since the wild horse population would increase more quickly. Plants would have less time to recover from over grazing which may necessitate adjusting the AML to a lower level.

4.1.3 Wild Horse Management – Alternative C (HMAP with Sterilization)

This Alternative would be similar to Alternative A except that some mares and/or stallions would be sterilized. The procedures outlined in Appendix D (Standard operating Procedures for Field Castration) would be followed. Since sterilizing offers a permanent form of birth control, fewer horses would be born than with the use of PZP alone. Current formulations of PZP are only effective for a maximum of22 months unless boostered annually and is effective in only about 90 percent of mares vaccinated. Since fewer horses would be born the need for gathers would decrease which could result in fewer gathers and fewer animals removed from the range. Gelding animals would also allow for fewer reproductive animals on the range as geldings could replace some of the mares while still maintaining AML.

4.1.4 Wild Horse Management – Alternative D (No Change)

Under the No Action Alternative, the BLM would not conduct any wild horse management actions within and outside the HMA in order to prevent the deterioration of the range that results from horse overpopulation and expansion of wild horse populations to areas not managed for wild horses. The No Action Alternative would not be in conformance with the CRMP as the AML would not be maintained. The No Action Alternative would not be consistent with the regulations that require the authorized officer to remove wild horses upon determination that excess wild horses are present. Under the No Action Alternative, the BLM would continue to monitor range health and wild horse populations.

The No Action Alternative would not be in conformance with existing laws and regulations which require the BLM to remove animals immediately upon determination that excess wild horses are present (per 43 CFR 4720.1). Under the No Action Alternative, the overpopulation of wild horses would not allow the BLM to manage for a thriving natural ecological balance or to manage for healthy rangelands within and outside the HMA.

4.2 Wetlands/Riparian Zones

4.2.1 Wetlands/Riparian Zones – Alternative A (proposed Herd Management Area Plan)

Wetlands and riparian areas provide essential habitat to many wildlife species, 77 percent of the assessed springs and riparian areas within the HMA are not properly functioning and/or trending downward. Under the Proposed Action (Alternative A), bringing the wild horse population to the lower AML level by allotment will benefit wetland/riparian areas by reducing the magnitude of impacts from grazing and hoof action enough to allow for recovery of riparian vegetation. Some of the riparian areas will require protective fencing to improve and some riparian areas with bare ground or channelization may require restoration activities to meet proper functioning condition. Removing excess wild horses to the AML by allotment would not result in improvements to the riparian areas as the horses are not distributed evenly throughout the HMA. Removing excess horses to the lower AML level of the HMA would still result in a concentration of horses in the Clifton, Eldorado Canyon, Hackett Canyon, and Mill Canyon allotments in excess of the amount of use that the riparian areas can sustain. Alternative A would allow for a reduced rate of wild horse population increase, thereby providing riparian areas a longer period of reduced use. According to the model, the maximum AML would take longer to reach. If funding is available to gather when the population reaches the trigger point, the riparian areas will benefit from managed wild horse populations. However, if BLM is unable to gather as prescribed in Alternative A due to lack of funding or available holding capacity, then the riparian areas are expected to return to the degraded condition they are currently in due wild horse impacts.

4.2.2 Wetlands/Riparian Zones – Alternative B (HMAP without Fertility Control)

Initial impacts would be the same as the Proposed Action, however if additional gathers did not occur, due to lack of funding or lack of space in holding facilities, improvement to riparian functional health is expected to decline.

4.2.3 Wetlands/Riparian Zones – Alternative C (HMAP with Sterilization)

Initial impacts would be the same as the Proposed Action. Alternative B is expected to result in gathering wild horses in a shorter return interval, since population numbers would increase quicker without fertility control. However if additional gathers did not occur, due to lack of funding or lack of space in holding facilities, improvement to riparian functional health is expected to decline.

4.2.4 Wetlands/Riparian Zones – Alternative D (No Change)

Under this alternative over use of springs and associated riparian areas would continue and expand as the wild horse population continues to increase. Maintenance to existing enclosure fences, meant to protect water sources for functionality and habitat values, would continue or may increasingly be an added workload to the SFFO staff and the BLM Support Services branch of the District. Currently there are many springs that are non-functional or functional at risk with a downward trend. This situation would be expected to continue or worsen as pressure from

horses would only increase. The No Action Alternative would not be in conformance with BLM 1737 Manual, RAC Standards and Guidelines, nor the Bi-State Sage-Grouse Plan Amendment.

4.3 General Wildlife

4.3.1 General Wildlife – Alternative A (proposed Herd Management Area Plan)

Key Habitat types and associated Ecological Systems (plant communities) in the HMA that could potentially be affected directly or indirectly by the Proposed Action are displayed in Table 17.

Table 13: **Key Habitat types and associated Ecological Systems that may exist and be potentially affected in the HMA. Based on SWReGAP descriptions (USGS 2005).**

Key Habitat / Associated Ecological System(s)	Potential Plant Species	Scientific Name
Intermountain Cold Desert Scrub / Intermountain Basins Mixed Salt Desert Scrub	Alkali sacaton	*Sporobolus airoides*
Sagebrush / Great Basin Xeric Mixed Sagebrush Shrubland, Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Grassland	Thurber's needlegrass Desert needlegrass Indian rice grass	*Achnatherum thurberianum* *Achnatherum speciosum* *Achnatherum hmenoides*
Lower Montane Woodlands / Great Basin Pinyon-Juniper Woodland	Bailey's greasewood	*Sarcobatus vermiculatus* var. *baileyi*
	Big sagebrush	*Artemisia tridentata*
	Black sagebrush	*Artemisia nova*
	Bottlebrush squirreltail	*Elymus elymoides*
	Bud sagebrush	*Picrothamnus desertorum*
	Common spikerush	*Eleocharis palustris*
	Desert needlegrass	*Achnatherum speciosum*
	Fourwing saltbush	*Atriplex canescens*
	Galleta	*Pleuraphis jamesii*
	Indian ricegrass	*Achnatherum hymenoides*
	Low sagebrush	*Artemisia arbuscula*
	Nevada jointfir	*Ephedra nevadensis*
	Needle and thread grass	*Hesperostipa comata*
	Rubber rabbitbrush	*Ericameria nauseosa*
	Saltbush spp	*Atriplex spp*
	Sandberg bluegrass	*Poa secunda*
	Shadscale saltbush	*Atriplex confertifolia*
	Spiny hopsage	*Grayia spinosa*
	Winterfat	*Krascheninnikovia lanata*
	Green rabbitbrush	*Chrysothamnus viscidiflorus*

Direct, short-term, localized impacts could occur to wildlife species during gather operations. Wildlife, including small mammals, rodents, and reptiles, could be trampled or have burrows

destroyed. However, any potential spatial displacement to big game, upland game, and resident birds would likely be temporary.

Horse numbers exceed the upper range of AML for the Pine Nut HMA. Beneficial indirect effects to wildlife resources would be expected from a reduction in horse numbers to within AML for the Pine Nut HMA and continued maintenance of horse numbers within AML, because the health of rangeland resources necessary for wildlife habitat would be protected by avoiding the habitat degradation associated with wild horse overpopulation. Managing horses within AML should provide adequate habitat requirements of forage, water, cover, and space for wildlife species.

Overall, if the gather and contraception efforts are successful, maintaining less utilization and competition for forage would benefit species dependent on these key habitats for food, water, and cover. Additionally, species that prey on wildlife that inhabit these plant communities, such as golden eagles, may benefit from an increased prey base over time.

Horse populations that increase over the upper limit of the AML can indirectly have long-term negative impacts to wildlife resources. If AML is exceeded over time and overutilization of vegetation and water sources by wild horses occurs, this is a factor in decreasing plant diversity and altering habitat structure (Beever and Brussard 2000). A less diverse plant community can be vulnerable to fire and in turn invasive grasses such as cheatgrass. Cheatgrass displaces native perennial shrub, grass, and forb species because of its ability to outcompete native plants for water and nutrients by germinating earlier and quicker. Cheatgrass is also adapted to recurring fires that are perpetuated in part by the fine dead fuels that it leaves behind. In general, most wildlife species have a difficult time thriving in these altered fire regimes because diverse native vegetation is required for food, water, and cover. Beever at al. (2008) conducted a study of vegetation response to removal of horses in 1997 and 1998 (part of this study was in the Clan Alpine HMA) and concluded that horse-removed sites exhibited 1.1–1.9 times greater shrub cover, 1.2–1.5 times greater total plant cover, 2–12 species greater plant species richness, 1.9–2.9 times greater native grass cover, and 1.1–2.4 times greater frequency of native grasses than did horse-occupied sites.

The effects of wild horses are not uniform across the landscape. Horses will utilize areas of the HMA that have more grasses because they are primarily grazers. Decreased cover and diversity of grasses and shrubs as well as decreased mammal burrow density have been documented at water sources utilized by wild horses (Beever and Brussard 2000, Ganskopp and Vavra 1986). Since available water is so limited in the Clifton allotment and to a lesser extent in other allotments individual horses may spend hours at a spring source attempting to obtain adequate water and upon their departure are replaced by other horses limiting water to many wildlife species including deer, pronghorn, bears and many other species of wildlife. Small mammals are a prey base for many species and as a result of degraded habitat, less prey can negatively affect raptors and carnivores that may inhabit the area. Mountain lion populations have been shown to predate foals which in turn increased lion numbers (Turner and Morrison 2001). If too many foals are born in these HMAs, mountain lion populations could increase and this in turn could impact deer survival or have ripple effects on the food web in general.

4.3.2 General Wildlife – Alternative B (HMAP without Fertility Control)

Initial impacts would be the same as the Proposed Action, however AML would increase quicker without the use of fertility control. If additional gathers did not occur in a timely manner, improvement to wildlife habitat would be minimal and would decline over time.

4.3.3 General Wildlife – Alternative C (HMAP with Sterilization)

Impacts would be the same as the Proposed Action.

4.3.4 General Wildlife – Alternative D (No Change)

If the wild horse population is left unchecked within the HMAs, the numbers will continue to increase over time. Increased numbers will result in increased impacts to many wildlife species and their habitats. These impacts will reach farther than the HMAs due to horses moving outside the HMAs as a result of decreased resources. While no direct, short-term, localized impacts from potential trampling and spatial displacement would occur to wildlife species because no gather operations would occur, horse populations that increase over the upper limit of the AML can indirectly have long-term negative impacts to wildlife resources. If AML is exceeded over time and overutilization of vegetation and water sources by wild horses occurs, this is a factor in decreasing plant diversity and altering habitat structure (Beever and Brussard 2000). A less diverse plant community can be vulnerable to fire and, in turn, invasive grasses such as cheatgrass. Cheatgrass displaces native perennial shrub, grass, and forb species because of its ability to outcompete native plants for water and nutrients by germinating earlier and quicker. Cheatgrass is also adapted to recurring fires that are perpetuated in part by the fine dead fuels that it leaves behind. In general, most wildlife species have a difficult time thriving in these altered fire regimes because diverse native vegetation is required for food, water, and cover. Beever at al. (2008) conducted a study of vegetation response to removal of horses in 1997 and 1998 (part of this study was in the Clan Alpine HMA) and concluded that horse-removed sites exhibited 1.1–1.9 times greater shrub cover, 1.2–1.5 times greater total plant cover, 2–12 species greater plant species richness, 1.9–2.9 times greater native grass cover, and 1.1–2.4 times greater frequency of native grasses than did horse-occupied sites.

Over-utilization of forage is occurring due to excess wild horses above the AML. High numbers of horses increases trampling effects in riparian areas, limits wildlife species access to water, and results in overgrazing of perennial grasses and meadows. Habitat has become degraded, which decreases forage, water and cover available to wildlife and decreases the prey base for wildlife species that forage in the HMAs. Over time this could decrease the abundance and diversity of wildlife species that inhabit the HMAs.

The effects of wild horses are not uniform across the landscape. Horses will utilize areas of the HMAs that have more grasses because they are primarily grazers. While impacts to water sources and riparian areas from horses are different than cattle due to behavior (horses tend to not linger at a source and drink in the morning and at night), decreased cover and diversity of grasses and shrubs as well as decreased mammal burrow density have been documented at water sources utilized by wild horses (Beever and Brussard 2000, Ganskopp and Vavra 1986). Horses

also tend to prevent other wildlife species from accessing water sources during critical times of the day, especially if multiple bands of horses frequent one source. Small mammals are a prey base for many species and as a result, less prey can negatively affect raptors and carnivores that may inhabit the area. Mountain lion populations have been shown to predate foals which in turn increased lion numbers (Turner and Morrison 2001). If too many foals are born in these HMAs, mountain lion populations could increase and this in turn could impact deer survival or have ripple effects on the food web in general.

4.4 BLM Sensitive Species (Animals)

4.4.1 BLM Sensitive Species (Animals) – Alternative A (proposed Herd Management Area Plan)

Impacts would generally be the same to BLM sensitive species as described in the Environmental Consequences, General Wildlife section (Section 4.3.1). Managing horses within AML should ensure habitat conditions that, over time, would benefit sensitive species by providing a diverse vegetation structure and composition that provides for the applicable life cycle requirements of any given species.

Minimizing or reducing levels of competition for water and forage would be beneficial to sensitive species dependent on key habitats for water, food, and cover. Sensitive species such as the golden eagle or ferruginous hawk that forage in the HMAs would benefit from a healthy prey base.

Sage-grouse require specific amounts of grass cover for optimal nesting habitat, an abundance of forbs for brood-rearing habitat, and free water with sufficient vegetation to support insects and to provide cover (Connelly et al. 2000). Bi-state sage grouse habitat can therefore be negatively affected if riparian areas and uplands are over-utilized as a result of an over-population of wild horses. Sage-grouse use sagebrush communities throughout their lifecycle, therefore, a healthy and diverse sagebrush community is essential for survival. Taller sagebrush that reaches above snow levels is an important food source for sage-grouse in winter. Higher canopy cover of sagebrush as well as sufficient perennial grass height in nesting habitat provides protection from predators. Recommended forage utilization standards are less than 45 percent use on herbaceous species within mountain big sagebrush communities and less than 35 percent use on herbaceous species within Wyoming sagebrush, basin big sagebrush and black sagebrush communities (LUPA). Hens and their broods rely on insects and a diversity of perennial forbs within riparian and meadow habitats to survive. Adequate sagebrush cover adjacent to these riparian and meadow habitats is important for cover. Forage utilization standards for riparian and wet meadows are less than 50 percent use of herbaceous species or an average stubble height of at least 4-6 inches (LUPA). To maintain healthy sagebrush habitats and these important habitat characteristics, grazing needs to be limited to the identified levels.

4.4.2 BLM Sensitive Species (Animals) – Alternative B (HMAP without Fertility Control)

Initial impacts would be the same as the Proposed Action, however AML would increase quicker without the use of fertility control. If additional gathers did not occur in a timely manner, improvement to wildlife habitat would be minimal and would continue to decline over time.

4.4.3 BLM Sensitive Species (Animals) – Alternative C (HMAP with Sterilization)

Impacts would be the same as the Proposed Action.

4.4.4 BLM Sensitive Species (Animals) – Alternative D (No Change)

Over-utilization of forage is occurring due to excess wild horses above the AML and would continue to occur. High numbers of horses increases trampling effects in riparian areas, limits wildlife species' access to water, and results in overgrazing of perennial grasses and meadows. Habitat would continue to become degraded, decreasing forage, water, and cover available to wildlife and decreasing the prey base for BLM sensitive species that forage in the HMAs. Over time this could decrease the abundance and diversity of sensitive wildlife species that inhabit the HMAs.

4.5 Migratory Birds

4.5.1 Migratory Birds – Alternative A (proposed Herd Management Area Plan)

Gather operations would not be expected to directly impact breeding populations of migratory bird species because operations would occur outside the breeding season. Direct, short-term, localized impacts could occur to resident birds during gather operations via potential spatial displacement of individual birds.

For reasons described in the Environmental Consequences, General Wildlife section (Section 4.3.1), managing wild horse populations within AML should maintain habitat conditions that benefit migratory bird species over the long-term by providing a diverse vegetation structure that provides for the applicable components of the life cycle requirements that any given species may need to successfully reproduce.

4.5.2 Migratory Birds – Alternative B (HMAP without Fertility Control)

Initial impacts would be the same as the Proposed Action, however AML would increase quicker without the use of fertility control. If additional gathers did not occur in a timely manner, habitat conditions would continue to decline over time.

4.5.3 Migratory Birds – Alternative C (HMAP with Sterilization)

Impacts would be the same as the Proposed Action.

4.5.4 Migratory Birds – Alternative D (No Change)

While no direct, short-term, localized impacts from potential spatial displacement would occur to migratory birds because no gather operations would occur, over-population of wild horses above the upper limit of the AML could indirectly have long-term negative impacts to migratory bird resources, such as riparian areas. Over-utilization of forage by wild horses is occurring and would continue to increase. Habitat would continue to become degraded, which would decrease

forage plants, prey populations, and cover available to migratory bird species. Over time this could decrease the abundance and diversity of species that inhabit the HMA.

4.6 Vegetation

4.6.1 Vegetation – Alternative A (proposed Herd Management Area Plan)

Alternative A takes the wild horse population to within AML, which promotes vegetative health. Native plant communities can only sustain a certain level of grazing utilization. The maximum AML is the number of wild horses that can be maintained within an HMA and not adversely impact the plant community in combination with other multiple uses such as wildlife and livestock grazing. Maintaining the wild horse population at or below AML, and distributing animals throughout the HMA reduces the utilization of vegetation by wild horses. This alternative reduces root crown damage and plant stress from over grazing. The ability of forage species to reproduce and compete with other species in the plant community is also improved without the stress of overgrazing. Under Alternative A modifications to wild horse grazing intensity and use patterns would improve plant community health in the Clifton, Eldorado, Hackett Canyon and Mill Canyon allotments. Because alternative A reduces the number of wild horses and redistributes animals within the HMA vegetative trend is expected to improve. Fertility control treatments would slow the growth of the wild horse population and delay negative impacts to vegetation from overgrazing. Modelling indicates the wild horse population is expected to exceed AML in 2025 under Alternative A.

4.6.2 Vegetation – Alternative B (HMAP without Fertility Control)

Impacts would be similar to those in Alternative A, however the duration of the positive impacts would be shorter under Alternative B without the fertility control treatment. Modelling indicates the wild horse population is expected to exceed AML in 2023 under Alternative B.

4.6.3 Vegetation – Alternative C (HMAP with Sterilization)

Impacts would be similar to those in Alternative A. Modelling indicates the wild horse population is expected to exceed AML in 2025 under Alternative C.

4.6.4 Vegetation – Alternative D (No Change)

Under the no action alternative wild horse populations are currently over AML and would continue to increase. When wild horse populations are above AML, overutilization of vegetation occurs. The potential negative effects of over-utilization to vegetation are root crown damage, plant stress and the reduced ability of forage species to reproduce and compete with other species in the plant community. If wild horse populations continue to exceed AML, the loss of desirable plant species would continue and would eventually be lost from the HMA and surrounding areas.

4.7 BLM Sensitive Species (Plants)

4.7.1 BLM Sensitive Species (Plants) – Alternative A (proposed Herd Management Area Plan)

All BLM sensitive plant species are in areas grazed by both wild horses and livestock. Managing wild horses within the AML would be expected to result in less grazing to the plant and less trampling and compaction of soils within the habitat.

4.7.2 BLM Sensitive Species (Plants) – Alternative B (HMAP without Fertility Control)

Impacts would be the same as the Proposed Action.

4.7.3 BLM Sensitive Species (Plants) – Alternative C (HMAP with Sterilization)

Impacts would be the same as the Proposed Action.

4.7.4 BLM Sensitive Species (Plants) – Alternative D (No Change)

High densities of wild horses may graze on BLM sensitive plant species with unknown impacts over time.

4.8 Livestock Grazing

4.8.1 Livestock Grazing – Alternative A (proposed Herd Management Area Plan)

Maintaining wild horse populations within AML would promote vegetative health. Reducing wild horse grazing would reduce the amount of grazing use within all allotments. Reducing wild horse use would alleviate the over grazing within the Clifton, Eldorado, Hackett Canyon and Mill Canyon allotments.

Reducing wild horse numbers to AML is beneficial because it contributes to improving range conditions. However, livestock grazing in the Clifton, Eldorado, Hackett Canyon, and Mill Canyon allotments would not be permitted until plant communities recover from overutilization by wild horses. Managing horses at AML, would provide adequate forage in the other allotments to support grazing by domestic livestock, in addition to wild horses, which would achieve or move toward meeting management objectives. Modelling indicates the wild horse population is expected to exceed AML in 2025 under Alternative A.

4.8.2 Livestock Grazing – Alternative B (HMAP without Fertility Control)

Impacts would be similar to the Alternative A, however, the duration of the positive impacts would be shorter under Alternative B without wild horse fertility control. Modelling indicates the wild horse population is expected to exceed AML in 2023 under Alternative B.

4.8.3 Livestock Grazing – Alternative C (HMAP with Sterilization)

Impacts would be similar to the Alternative A. Fertility control is depended upon multiple treatments to slow the population growth rate whereas sterilization will slow the population growth rate after one treatment. Modelling indicates the wild horse population is expected to exceed AML in 2025 under Alternative C.

4.8.4 Livestock Grazing – Alternative D (No Change)

Declining plant community health negatively impacts all land uses including livestock grazing. Over utilization of vegetation, can shift plant community composition by reducing the types of vegetation that is palatable to livestock and wild horses, as well as reduce the amount of forage.

4.9 Noxious and Invasive Weeds

4.9.1 Noxious and Invasive Weeds – Alternative A (proposed Herd Management Area Plan)

Intact healthy native plant communities are more resistant to the establishment and spread of noxious weeds. By managing wild horses at a level compatible with the native plant communities, noxious weeds will be less likely to become established and spread.

4.9.2 Noxious and Invasive Weeds – Alternative B (HMAP without Fertility Control)

Impacts would be the same as the Proposed Action.

4.9.3 Noxious and Invasive Weeds – Alternative C (HMAP with Sterilization)

Impacts would be the same as the Proposed Action.

4.9.4 Noxious and Invasive Weeds – Alternative D (No Change)

Under the no action alternative the wild horse population would continue to increase further adversely impacting the health of the native plant communities. Stressed native plant communities, facilitate the establishment and spread of noxious and invasive weeds.

4.10 Human Health and Safety

4.10.1 Human Health and Safety – Alternative A (proposed Herd Management Area Plan)

Public safety as well as that of the BLM and contractor staff is always a concern during the gather operations and would be addressed through Observation Protocols that have been used in recent gathers to ensure that the public remains at a safe distance and does not get in the way of gather operations, and by the presence of law enforcement officers at the site. These measures minimize the risks to the health and safety of the public, BLM staff and contractors, and to the wild horses themselves during the gather operations.

4.10.2 Human Health and Safety – Alternative B (HMAP without Fertility Control)

Impacts would be the same as the Proposed Action.

4.10.3 Human Health and Safety – Alternative C (HMAP with Sterilization)

Impacts would be the same as the Proposed Action.

4.10.4 Human Health and Safety – Alternative D (No Change)

There would be no safety concerns to BLM employees, contractors and the general public from the gather operations as no gather activities would occur.

4.11 Areas of Critical Environmental Concern

4.11.1 Areas of Critical Environmental Concern – Alternative A (proposed Herd Management Area Plan)

By managing within the AML by allotment minimal adverse impact would be expected to occur to the Churchill Narrows Buckwheat and Williams Combleaf. Bi-State sage-grouse habitat would improve, though further adjustments maybe needed to meet all of the habitat requirements.

Cultural Areas would be maintained in a more natural state, as native plants, animals, springs and seeps would be less impacted by wild horses.

4.11.2 Areas of Critical Environmental Concern – Alternative B (HMAP without Fertility Control)

Impacts would be the same as the Proposed Action.

4.11.3 Areas of Critical Environmental Concern – Alternative C (HMAP with Sterilization)

Impacts would be the same as the Proposed Action.

4.11.4 Areas of Critical Environmental Concern – Alternative D (No Change)

By not managing the wild horse population within the AML, adverse impacts to Churchill Narrows Buckwheat and Williams Combleaf may occur as high densities of horses may consume or trample these plants. Habitat objectives for the Bi-State sage-grouse would not be met as overgrazing would adversely impact the native bunch grasses needed for nest concealment and riparian areas and meadows important for brood rearing would be over grazed.

Cultural Areas would not be maintained in a more natural state, as native plants, animals, springs and seeps would be over grazed facilitating establishment of noxious and invasive weeds. Springs and seeps would be denuded and have the appearance of mud holes.

4.12 Lands with Wilderness Characteristics

4.12.1 Lands with Wilderness Characteristics – Alternative A (proposed Herd Management Area Plan)

This alternative would have no effect on wilderness characteristics related to size or outstanding opportunities for solitude or primitive and unconfined recreation. Managing the wild horse population at AML within the HMA will have a positive effect on naturalness within the four units located within or partially within the HMA since the wild horse value is being retained and there would be improved riparian areas and uplands. It is hoped that by managing wild horses within the AML range by allotment that riparian areas will recover.

4.12.2 Lands with Wilderness Characteristics – Alternative B (HMAP without Fertility Control)

Impacts would be the same as the Proposed Action.

4.12.3 Lands with Wilderness Characteristics – Alternative C (HMAP with Sterilization)

Impacts would be the same as the Proposed Action.

4.12.4 Lands with Wilderness Characteristics – Alternative D (No Change)

Current over use of the springs detracts from the area's naturalness as the horse population increases the damage to the springs and riparian areas would be expected to increase.

4.13 Cultural Resources

4.13.1 Cultural Resources – Alternative A (proposed Herd Management Area Plan)

Alternative A would have a beneficial effect to NRHP-eligible cultural resources ("historic properties"). Currently, the large horse population causes adverse impacts to historic properties through ground disturbance in areas moderately to heavily used by the horses. Impacts to native vegetation, riparian areas, and wildlife habitat are strong indicators of the impacts to historic properties, as impacts to these other resources include ground disturbance and increased potential for erosion. The proposed action would reduce impacts to historic properties by reducing the size and intensity of ground disturbance caused by horses. The actions proposed in Alternative A to slow population growth and maintain a regular gather schedule would reduce new and ongoing impacts to historic properties from ground disturbance caused by horses.

4.13.2 Cultural Resources – Alternative B (HMAP without Fertility Control)

Alternative B would have a beneficial effect to historic properties, but the benefit to the resource would be less than Alternative A. Without fertility control, the horse population would grow more rapidly between gathers, and would therefore allow for a continuation of greater adverse

impacts to historic properties by a larger number of horses on the landscape. If conditions preclude adhering to the proposed gather schedule, population numbers could once again become very high, and horse use and associated adverse impacts from ground disturbance would increase along with the population.

4.13.3 Cultural Resources – Alternative C (HMAP with Sterilization)

Alternative C would have a beneficial effect to historic properties similar to Alternative A, due to similar slowing of population growth and reduced ground disturbance.

4.13.4 Cultural Resources – Alternative D (No Change)

Alternative D would have an adverse impact to historic properties by allowing the horse population to continue to increase. Continued growth in the horse population would mean continued increase in impacts from moderate to heavy use by horses, including ground disturbance, loss of vegetation cover, and increased erosion potential.

4.14 Residual Effects

"Residual effects" are those adverse effects that remain after implementation of mitigation measures. No major adverse effects ("significant" per 43 CFR 1508.27) have been identified in this preliminary EA that warrant mitigation. Measures have been incorporated into the elements of the Proposed Action to avoid and minimize adverse effects. No mitigation is necessary; there would be no residual effects.

5.0 Cumulative Effects

A cumulative effect is defined under the NEPA as "the change in the environment which results from the incremental impact of the action, decision, or project when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other action". "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR Part 1508.7). Past, present, and reasonably foreseeable future actions are analyzed to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the Proposed Action and/or Alternatives may have an additive and significant relationship to those effects.

Cumulative Effects Geographic Area.
The cumulative effects study area (CESA) for the Project is the Pine Nut Mountains, an area encompassing approximately 397,899 acres (Figure 16). Approximately 73 percent (289,872 acres) of the CESA is managed by the BLM, and 27 percent (108,827 acres) of the CESA is privately-owned or Indian trust lands. The CESA boundary for individual resources may be artificial (administrative) or natural (Table 18). Only those resources directly or indirectly affected by the Proposed Action and/or Alternatives are analyzed for cumulative effects (Tables 7 and 8.

Table 14. CESA by Resource and Summary of Effects.

Resource	Type of Effect	Acres
Wild Horses and Burros	Direct effects during implementation from gather activities that can cause injury and administration of population control treatments; indirect effects by long-term beneficial changes to vegetative communities and wildlife dependent on these communities, through reduced grazing by wild horses.	397,899
Wetlands/Riparian Zones	Direct effects during implementation by disturbances to vegetation by motorized vehicles, people and wild horses that crush or trample plants; indirect effects by long-term beneficial changes to riparian vegetative communities through reduced grazing by wild horses.	* 100
General Wildlife, BLM Sensitive* Species (Animals), Migratory Birds	Direct effects during implementation from motorized vehicles, aircraft, people, wild horses that cause displacement; indirect effects by long-term beneficial changes to vegetative communities through reduced grazing by wild horses.	100 397,899
Vegetation	Direct effects during implementation by disturbances to vegetation by motorized vehicles, people and wild horses that crush or trample plants; indirect effects by long-term beneficial changes to vegetative communities through reduced grazing by wild horses.	10 397,899
BLM Sensitive Species (Plants)	Direct effects during implementation by removal of vegetative resources; indirect effects by long-term beneficial changes to vegetative communities through reduced grazing by wild horses.	* 10
Livestock Grazing	Direct effects during implementation from displacement; indirect effects by long-term beneficial changes to vegetative communities through reduced grazing by wild horses.	100 397,899
Noxious and Invasive Weeds	Direct effects during implementation from motorized vehicles, people and animals that can transport seed and/or vegetation to other locations.	*

Health and Human Safety	Direct effects during implementation from motorized vehicles, aircraft, people, wild horses that can cause injury.	100

* There would be no adverse direct effects as these areas would be avoided.

Timeframe for Effects Analysis.
Short-term cumulative effects would occur during implementation, anticipated to be from seven to ten days. Long-term cumulative effects would be expected to occur over several years.

Past, Present, and Reasonably Foreseeable Actions.

Past and Present Actions.
Wildfire and Vegetation Treatments. The Pine Nut Mountains were subject to a historic regime of wildfire caused by lightning strikes. Natural-caused fire can burn several acres to several thousand acres during one event. In more modern times, the area is also subject to man-caused wildfire in addition to natural (lightning-caused) fire. The wildfire history for the CESA is included in Table 19. Past and present vegetation treatments (Table 20) have been completed in the CESA to reduce catastrophic wildfire risks and to influence plant community composition and diversity. In response to the Bison Fire which occurred in July 2013, the BLM prepared an Emergency Stabilization and Burned Area Rehabilitation Plan (ESR) (BLM 2013). In November 2013, chaining occurred on approximately 1,350 acres, and aerial seeding occurred over 6,482 acres within the 24,140 acre burn area. The Buckskin Valley Vegetation Treatment Project was a multi-year effort to treat up to 7,000 acres on the east side of the CESA. This project was impacted by the 2013 Bison fire and was completed in 2014. In April 2014 the BLM approved the Pine Nut Land Health Project which would treat approximately 24,564 acres over a 10 to 15 year period (BLM 2014).

Table 15. Historic Large Fires.

Fire Name	Fire Year	Fire Cause	Acres
Minnehaha	2015	Human	251
Bison	2013	Natural	24,140
TRE	2012	Human	7,153
Springs	2012	Natural	1,191
Preacher	2012	Natural	1,076
Como	2012	Natural	768
Ray May	2011	Human	3,815
Burbank	2011	Natural	1,113
Laurel	2011	Human	318
Holbrook	2011	Human	133
Como	2008	Human	451
Adrian	2007	Natural	14,004

Fires greater than 100 acres.
Source: BLM Wildland Fire Management Information (2015).

Table 16. Past/Present Vegetation Treatments.

Project Name	Treatment Year(s)	Treatment Type(s)	Acres
Pine Nut Land Health (Mill Canyon 2, Illinois, Lyon units)	2014-2015	Lop and scatter, grinding	3,436
Buckskin Valley	2012-2014	Lop and scatter, grinding	2,926
Upper Colony II	2010-2011	Grinding, biomass removal	1,075
Mill Canyon	2007-2010	Lop and scatter, grinding	2,383

Bluebird	2008-2009	Grinding	253
Brunswick Extension	2006	Grinding	30
Upper Colony	2006	Grinding	110
Deer Run/Mexican Dam	2005, 2011, 2014	Grinding, seeding	90

Source: BLM GIS database (2015).

Wild Horse Management. The HMA is within the CESA. In 1975, the first reliable inventory of wild horses was completed, which identified an estimated 297 animals in the HA. In 1995, the Final MUD set the AMLs for wild horses between 118-179 animals. Gather and removal of wild horses has continued periodically since 1978. The most recent action occurred in December 2010, although the effort was a gather and remove/fertility control treatment effort (BLM 2010a). Approximately 45 mares were gathered, treated with PZP-22, and released back into the HMA. Sixty-five excess wild horses residing outside the HMA were removed.

Recreation. Dispersed recreation has occurred throughout the CESA. General activities include: rock hounding, hunting, sightseeing, OHV use, and wildlife viewing. Members of area tribes collect pinyon pine nuts. Annually in certain areas, the BLM permits woodcutting/firewood gathering and cutting/removal of younger evergreen trees for the holiday season. The BLM permits non-commercial and commercial recreation events through its Special Recreation Permit (SRP) program. Events include motorcycle enduro races usually lasting one to three days, all-terrain vehicle tours, and horse endurance riding. Table 21 lists the past and current SRP's authorized in the CESA. In March of 2015 construction was completed on a six-mile non-motorized hiking trail adjacent to the Pine Nut Road. An additional six-mile non-motorized hiking trail has been authorized adjacent to Stephanie Way.

Table 17. Special Recreation Permits*.

Name	Permit (Years)	Type	Area
NASTR 30/50/75 (Dayton)	2012-2017	Horse endurance ride	56 miles
High Desert	2013-2018	Horse endurance ride	22 miles
Pine Nut Cracker	2012-2016	Mountain bike race	11 miles
Pine Nut Express	2012-2013	Horse endurance ride	38 miles
Eastern Sierra ATV & UTV Jamboree	2012-2019	Guided OHV tours	238 miles
Valley Off-Road Racing Association	2010-2014	Competitive OHV races	15 miles
Nevada Adventure Company	2012-2017	Guided OHV tours	146 miles

* All SRP activities occur on existing trails and/or roads.

Travel Management. Most of the CESA is an "open and unlimited use" area for travel management. Although most of the vehicle use occurs on existing two-track trails and dirt roads, OHV use is also permitted. Actual numbers of users per day or per year are not available, but generally speaking the intensity of use is low and dispersed. Most use occurs during spring to fall. The BLM maintains approximately 108 miles of routes within CESA under the Carson City District Office Transportation Plan. According to preliminary route inventory data, there are approximately 1,700 miles of travel routes in the Pine Nut Mountains. These routes range from single track trails to maintained gravel or dirt roads. A final inventory and designation of approved routes would not occur until the BLM completes a Travel Management Plan (date unknown).

Lands and Realty. Within the CESA there have been a wide range of realty actions. Rights-of-way (ROW) have been issued for overhead transmission lines, roads, communication towers (Pine Nut, Rawe Peak), and wind testing (expired). There are two NV Energy transmission lines in the CESA: the 16-mile Brunswick to Anaconda line, and the four-mile Smith Valley/Topaz line.

Abandon Mine Lands/Mining Exploration. In 2012 and 2013 the BLM authorized the closure of 13 abandon mines in the CESA. Closure of abandon mines involves either the permanent filling in of a mine shaft, or installation of a bat gate. In December of 2013, the BLM authorized a Plan of Operations for the Hercules Exploration Project. Over a three-year period, exploration drilling would occur on approximately 18 acres of public lands from constructed roads, drill sites and trenching. Upon the conclusion of the exploration activities, the exploration area would be reclaimed (BLM 2014b).

Land Ownership Pattern. The Pine Nut Mountains is a mix of public, private and Indian trust lands. Approximately 73 percent of the CESA is managed by the BLM, and 27 percent of the CESA is privately-owned. Outside of BLM's jurisdiction are activities such as recreation, including OHV use and hunting, residential and energy development. Bentley LLC is the largest non-federal land owner in the Pine Nut Mountains.

Livestock Grazing. Historically, livestock grazing is known to have occurred in the Pine Nut Mountains since the 1930's under BLM permitting, although sheep and/or cattle grazing are likely to have been occurring in the area since the late 1800s. The Pine Nut Mountains overlaps with 17 livestock grazing allotments, and the HMA overlaps with nine allotments (Figure 8). In addition to authorizing livestock grazing, as a part of grazing management the BLM has authorized the construction and maintenance of allotment boundary fences, pasture fences, corrals, and water developments such as troughs and underground pipelines.

Noxious and Invasive Weeds. The BLM treats noxious and invasive weeds through an integrated weed management plan using manual, mechanical, biological, chemical methods to eradicate or control weed species. In July 2015 the BLM authorized herbicide treatments on approximately 15 acres of public lands to address Canada thistle infestations.

Climate Change. Over the last century average temperatures within the Great Basin have increased 0.6 – 1.1 °F. Increased precipitation has been documented in parts of Nevada, along with changes in species distribution and populations. Snowpack has been documented to be on the decline since 1950. The earlier arrival of spring runoff, greater frequencies and intensities of wildland fire and invasion of non-native species such as cheatgrass are attributable to global climate change. Winter temperatures have risen faster than any other season (Dugelby 2011, Chambers 2008).

Reasonably Foreseeable Actions.
On-going activities in the CESA include administration of the grazing program, issuance of SRPs for non-commercial and commercial activities, wild horse management, issuance of ROWs as requests are submitted to the BLM, and authorization of mining exploration plans. A district-wide planning effort is underway to revise the Resource Management Plan (RMP). Prepared

originally in the early 1980's, the new RMP may change allocation of resources and how they are used. A decision on the RMP is not anticipated until late 2016. Upon the conclusion of the RMP revision, a Travel Management Plan would be prepared, however the date for this is unknown.

Projected warming for the Great Basin ranges from 3.6 to 9 °F over the next century. The loss of snowpack is likely to continue and may accelerate. Higher levels of carbon dioxide (CO_2) may increase plant growth and exacerbate the spread of invasive species such as cheatgrass which has great flammability. The frequency and spread of fire is likely to grow. Pinyon-juniper would likely respond favorably to the increased CO_2 and crown fires may increase. Insect outbreaks could increase during warming episodes (Chambers 2008).

Effects Analysis.
The BLM did not analyze cumulative effects for the following resources because the BLM determined there would not be direct or indirect effects caused by the Proposed Action or Alternatives, or the because the resource is not present. Resources not analyzed for cumulative effects include: environmental justice, farm lands (prime or unique), floodplains, threatened or endangered species, wastes, hazardous or solid, wild and scenic rivers, wilderness/wilderness study area, global climate change, greenhouse gas emissions, land use authorizations, lands with wilderness characteristics, minerals, paleontological, recreation, socioeconomics, soils, and travel management.

Wild Horses and Burros
Cumulative effects of managing within the ALM range in balance with the productivity of their habitat could include the loss of some alleles, improved habitat benefiting both wild horses and wildlife and the continued use of contraceptives. The loss of alleles can be mitigated by introducing a few wild horses from other HMAs shortly after a gather. Continued use of PZP may provide permanent contraception after the fifth application, however, approximately, 20 percent of the wild horses would never be gathered and likely not vaccinated and fertility control is not 100% effective. If low productivity becomes a problem vaccinating fewer mares would result in an increased foaling rate.

Wetlands/Riparian Zones
Cumulative effects of maintaining a small population of wild horses would be increased health of riparian areas, likely reversing the declining trend of many riparian areas and possible improvement, i.e. from non-functioning to functional at risk or even to proper functioning.

General Wildlife
Cumulative effects of maintaining a small population of wild horses would be improved wildlife habitat which in turn would lead to more abundance and diversity of native species of wildlife.

BLM Sensitive Species (Animals)
Cumulative effects of maintaining a small population of wild horses would be improved habitat which in turn would be expected to lead to more abundance and diversity of special status species of wildlife.

Migratory Birds
Cumulative effects of maintaining a small population of wild horses would be improved migratory bird habitat which in turn would lead to more abundance and diversity of migratory birds.

Vegetation
Cumulative effects of maintaining a small population of wild horses would be increased health and vigor of the native plant community which in turn would be more resilient to fire and less vulnerable to noxious and invasive weeds.

BLM Sensitive Species (Plants)
Cumulative effects of maintaining a small population of wild horses would be fewer negative impacts to sensitive plant species.

Livestock Grazing
Cumulative effects of maintaining a small population of wild horses would be increased health and vigor of the native plant community which would provide forage for domestic livestock grazing.

Noxious and Invasive Weeds
Cumulative effects of maintaining a small population of wild horses would be increased health and vigor of the native plant community which in turn would be more resilient to fire and less vulnerable to noxious and invasive weeds.

Human Health and Safety
The effect of conducting a gather would be the possibility of accidents either involving the use of aircraft, driving, or handling horses and equipment. Effects to the public would be minimized by enforcing public viewing policies which keeps the public at a safe distance from aircraft or herded horses.

6.0 Consultation and Coordination

6.1 Public Review and Comment

The Pine Nut Mountains Wild Horse Gather Plan Preliminary Environmental Assessment (DOI-BLM-NV-C0200-2016-0020EA) has been made available to the public, organizations, and other agencies for a 30-day public review and comment period. The comment period closes on January 22, 2017.

Although not required for a preliminary EA by regulation, an agency may respond to substantive and timely comments. Substantive comments:

1) Question, with reasonable basis, the accuracy of the information in the preliminary EA;
2) Question, with reasonable basis, the adequacy of, methodology for, or assumptions used for the environmental analysis;
3) Present new information relevant to the analysis;
4) Present reasonable alternatives other than those analyzed in the preliminary EA; and/or
5) Cause changes or revisions in one or more of the alternatives.

Upon the conclusion of the comment period, the BLM would review, categorize, and summarize the comments. Responses to substantive comments would be included in an appendix to the Final EA.

6.2 Individuals, Tribes, Organizations and Agencies Consulted

The following individuals, organizations, and other agencies were notified of this document's availability for commenting:

6.2.1 Individuals

An email notifying individuals on the CCDO wild horse and burro list, and the BLM NV State wild horse and burro list was sent providing the web location of this EA and associated documents. The email also invited comments through the 30 day comment period starting December 22, 2016.

6.2.2 Tribes

Washoe Tribe of Nevada and California
Yerington Paiute Tribe

6.2.3 Organizations & Agencies

A press release, including the web location of this EA and associated documents, inviting comments through the 30 day comment period starting December 22, 2016. The press release was issued to the Reno Media, Northern Nevada and Northern California Media and Southern Nevada Media. This information was also sent to the NV Congressional list, Nevada State Clearing House and the USFWS.

6.3 List of Preparers

BLM staff that contributed to this document:

Name	Resource
John Axtell	Wild Horses and Wildlife
Niki Cutler	Soils and Hydrology
Katrina Leavitt	Livestock Grazing and Vegetation
Dean Tonenna	Special Status Plants and noxious weeds
Arthur Callan	Outdoor Recreation Planner
Rachel Crews	Cultural Resources and Native American Religious Concerns
Katrina Krause	General Wildlife, BLM Sensitive Species, Migratory Birds
Gerrit Buma	Planning and Environmental Coordinator (NEPA)

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(Full list of Citations as of Nov 10 2016)

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8.0 MAPS

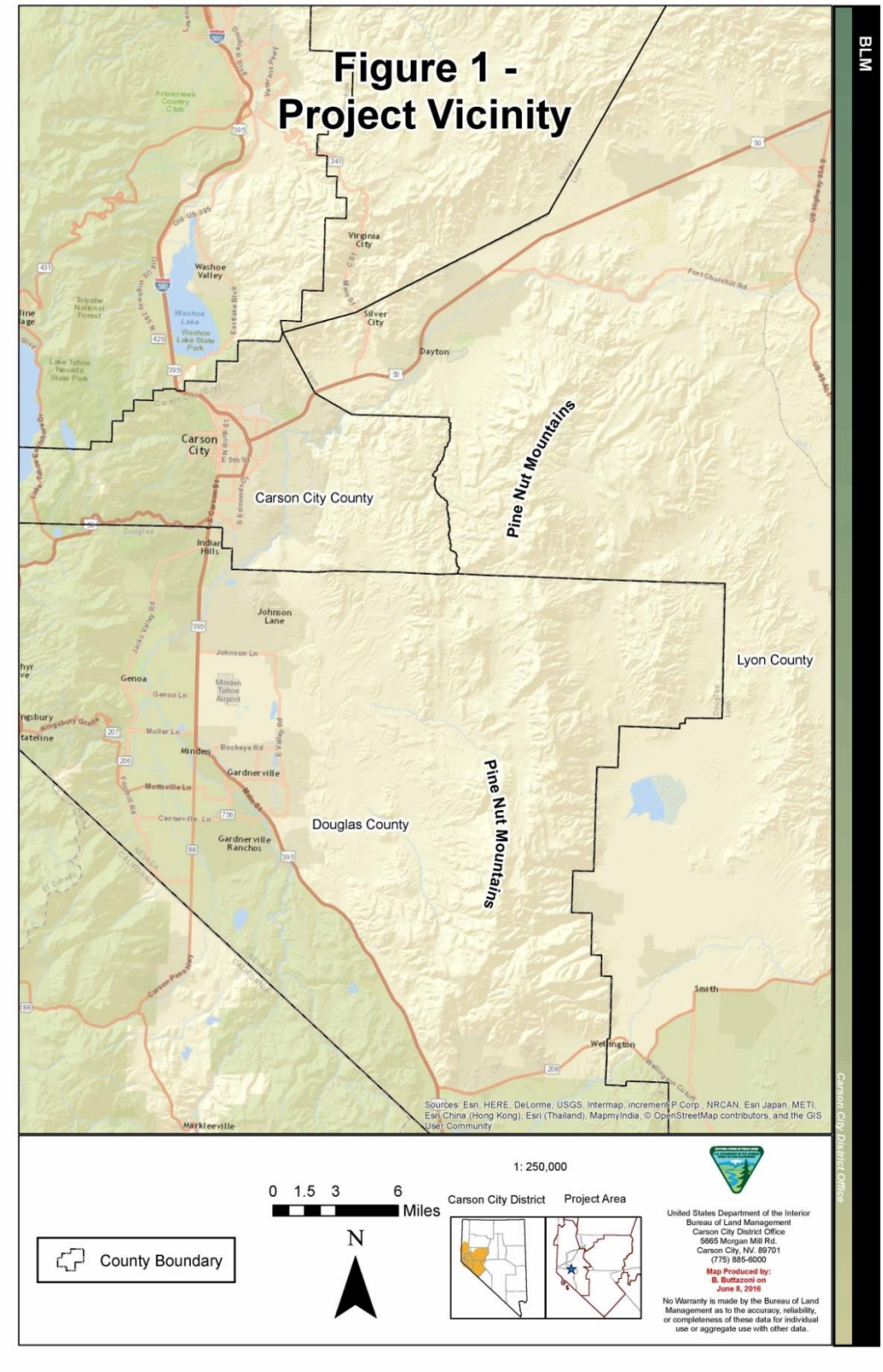

Figure 1, Project Vicinity

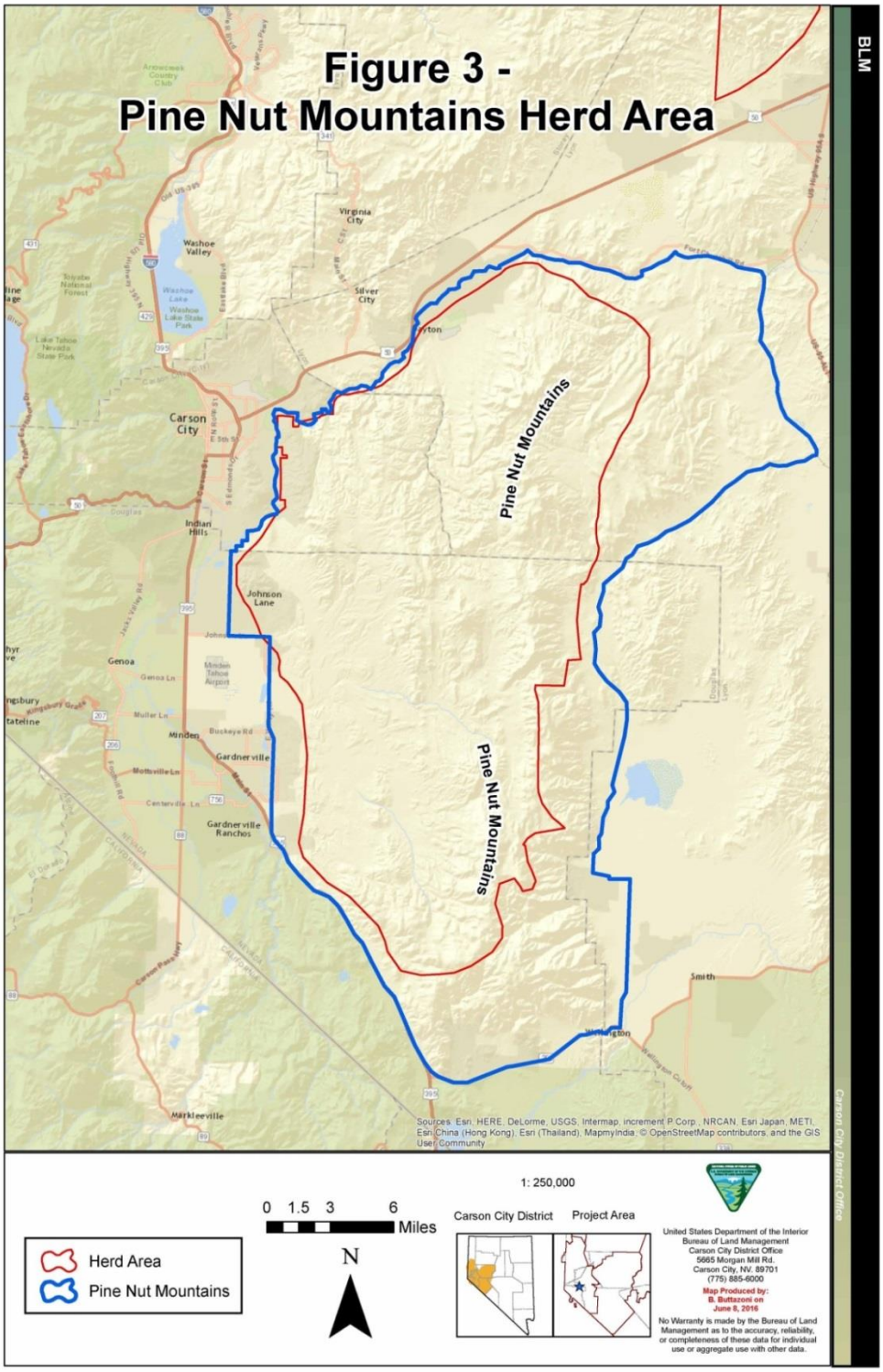

Figure 2, Project Area

Figure 3, Pine Nut Mountains Herd Area (HA)

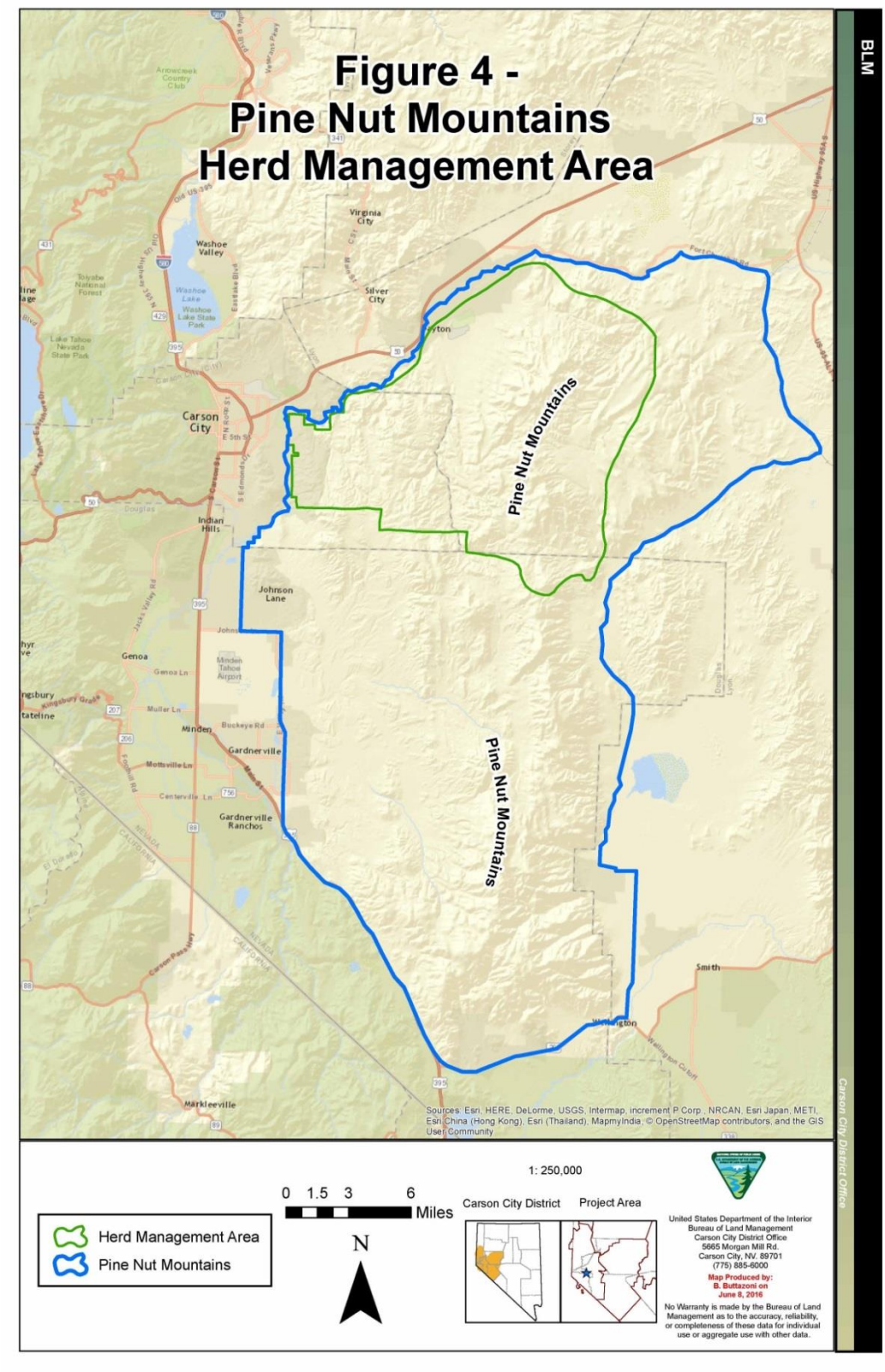

Figure 4, Pine Nut Mountains Herd Management Area (HMA)

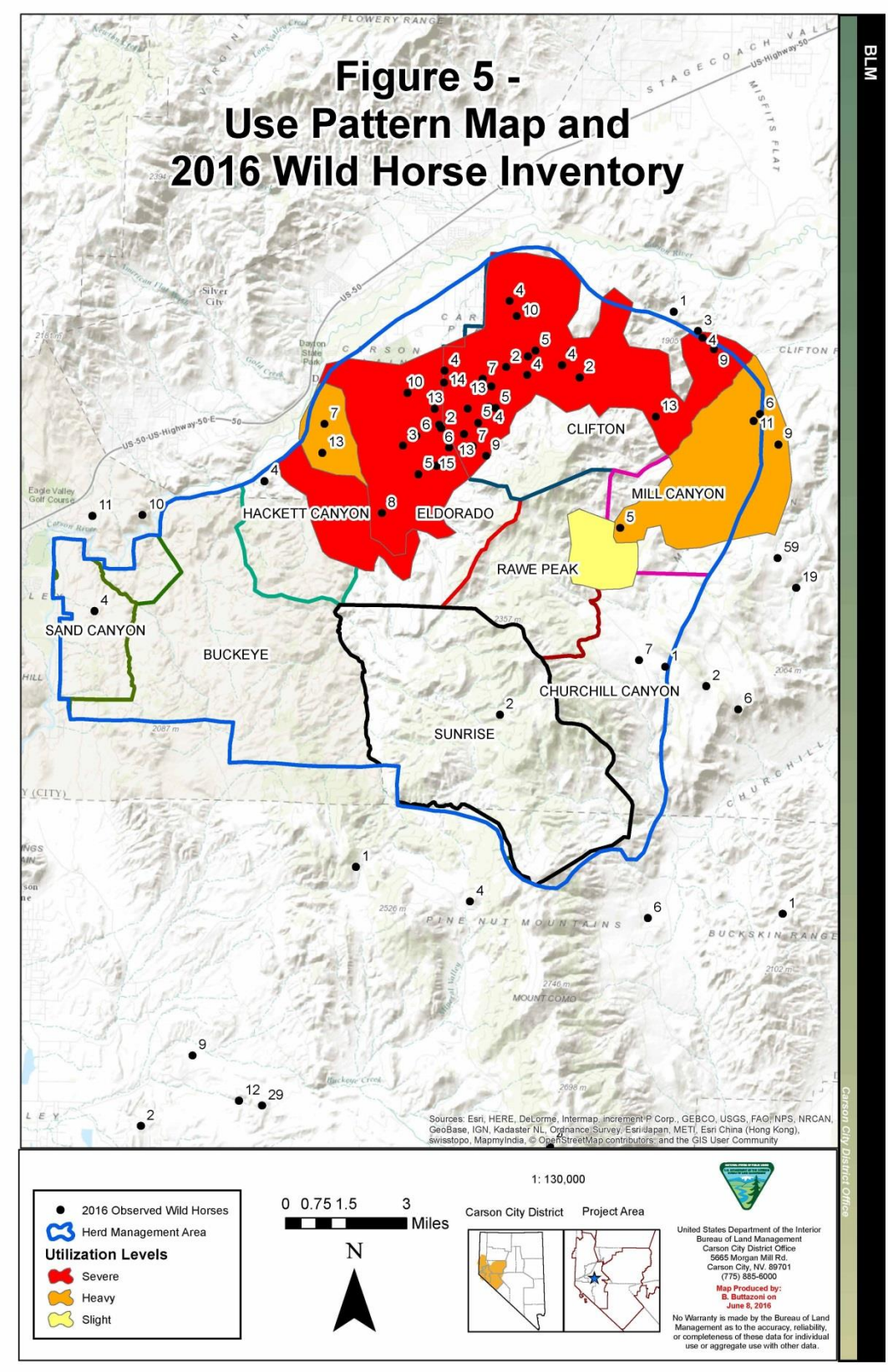

Figure 5, Use Pattern Map and 2016 Wild Horse Inventory

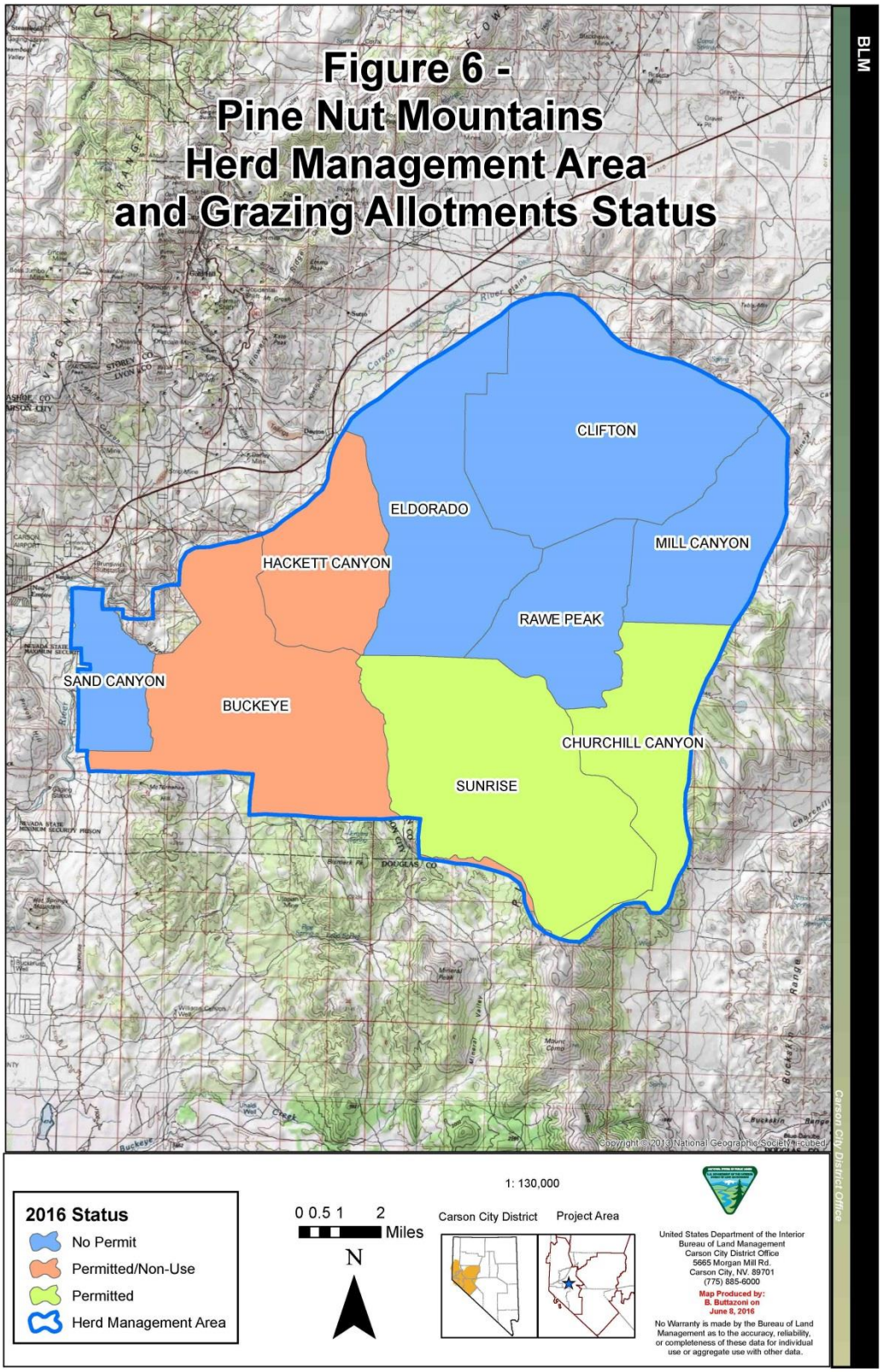

Figure 6, Grazing Allotment Status

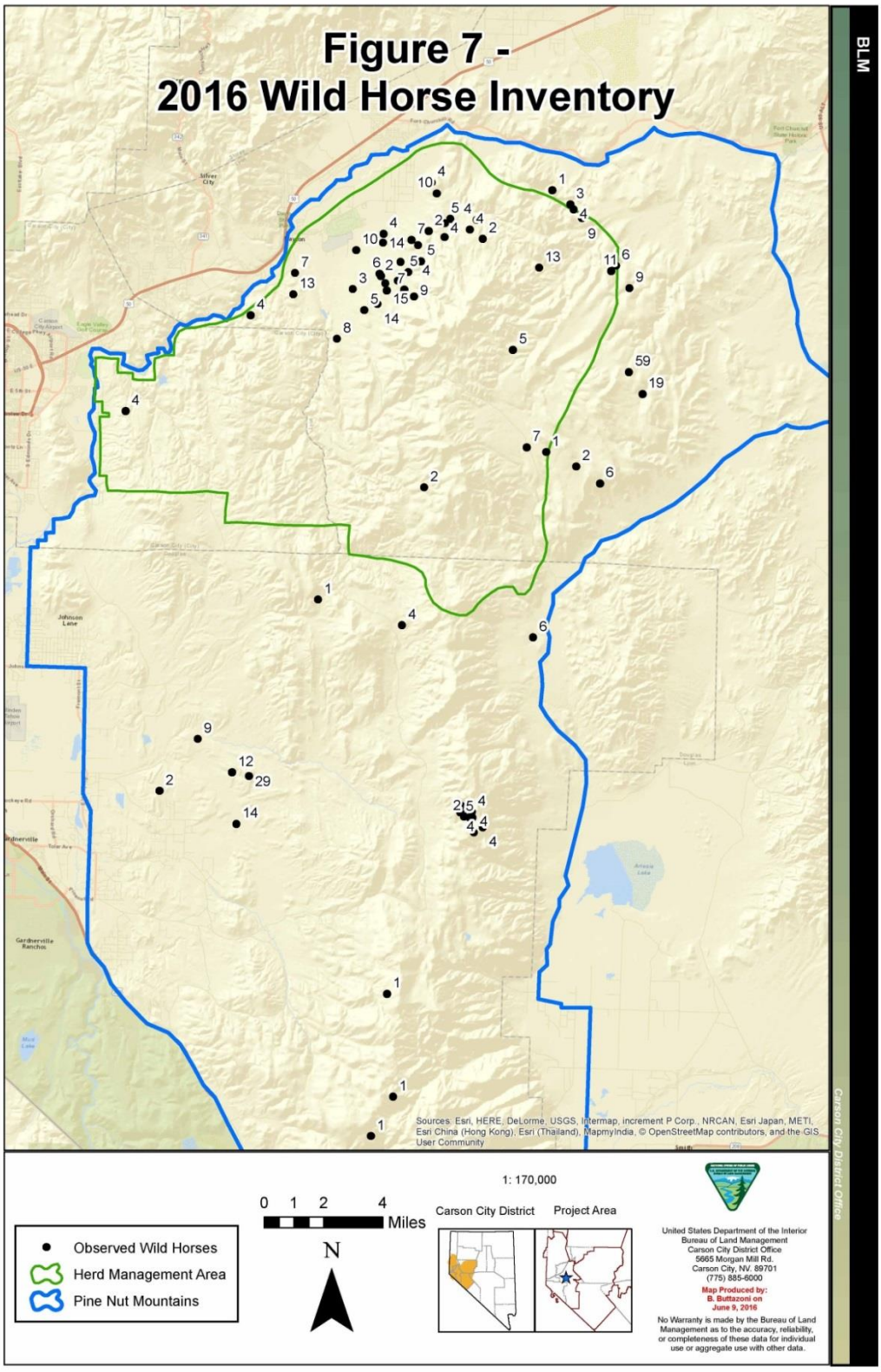

Figure 7, 2016 Wild Horse Inventory

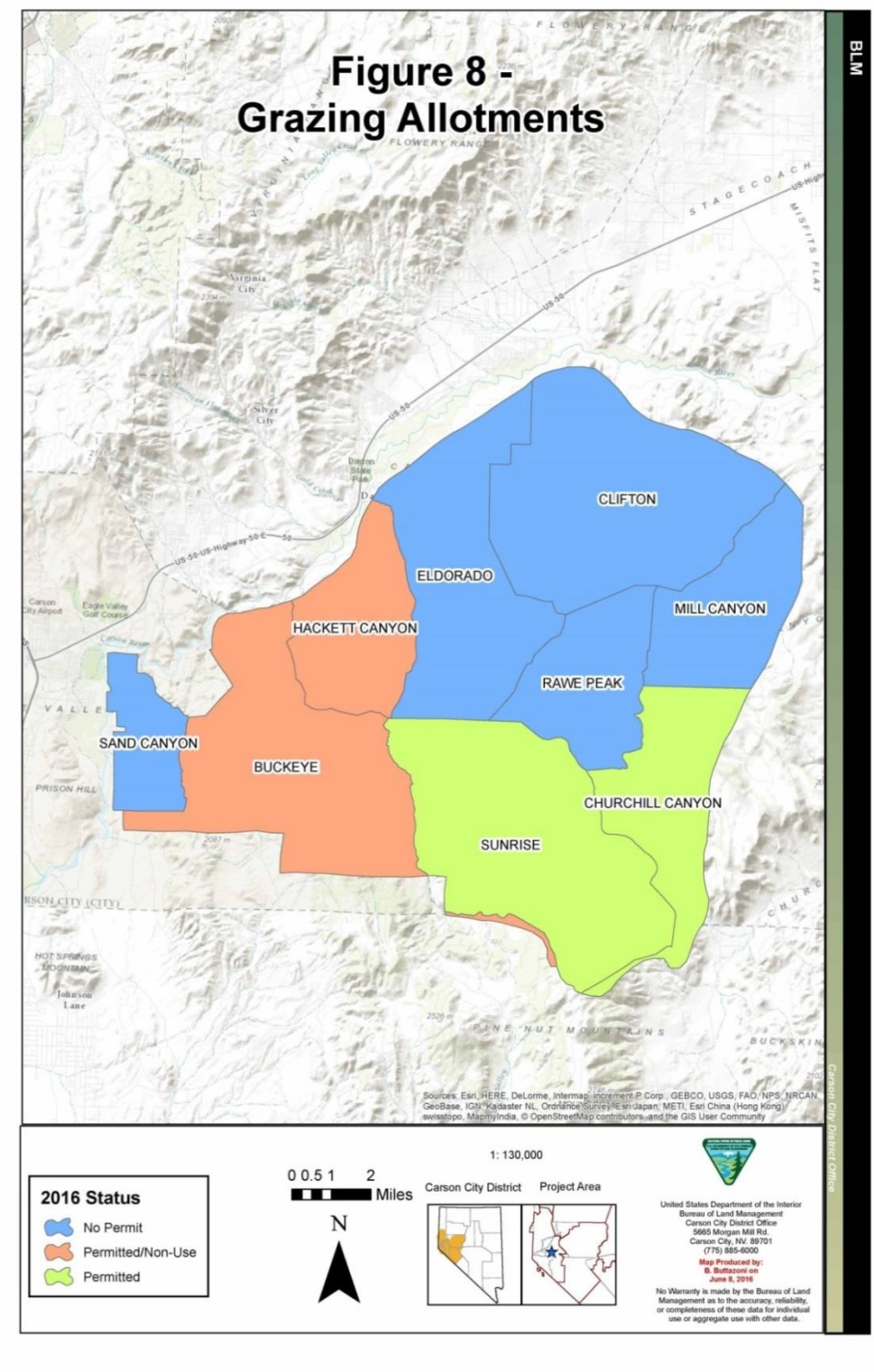

Figure 8, Grazing Allotments

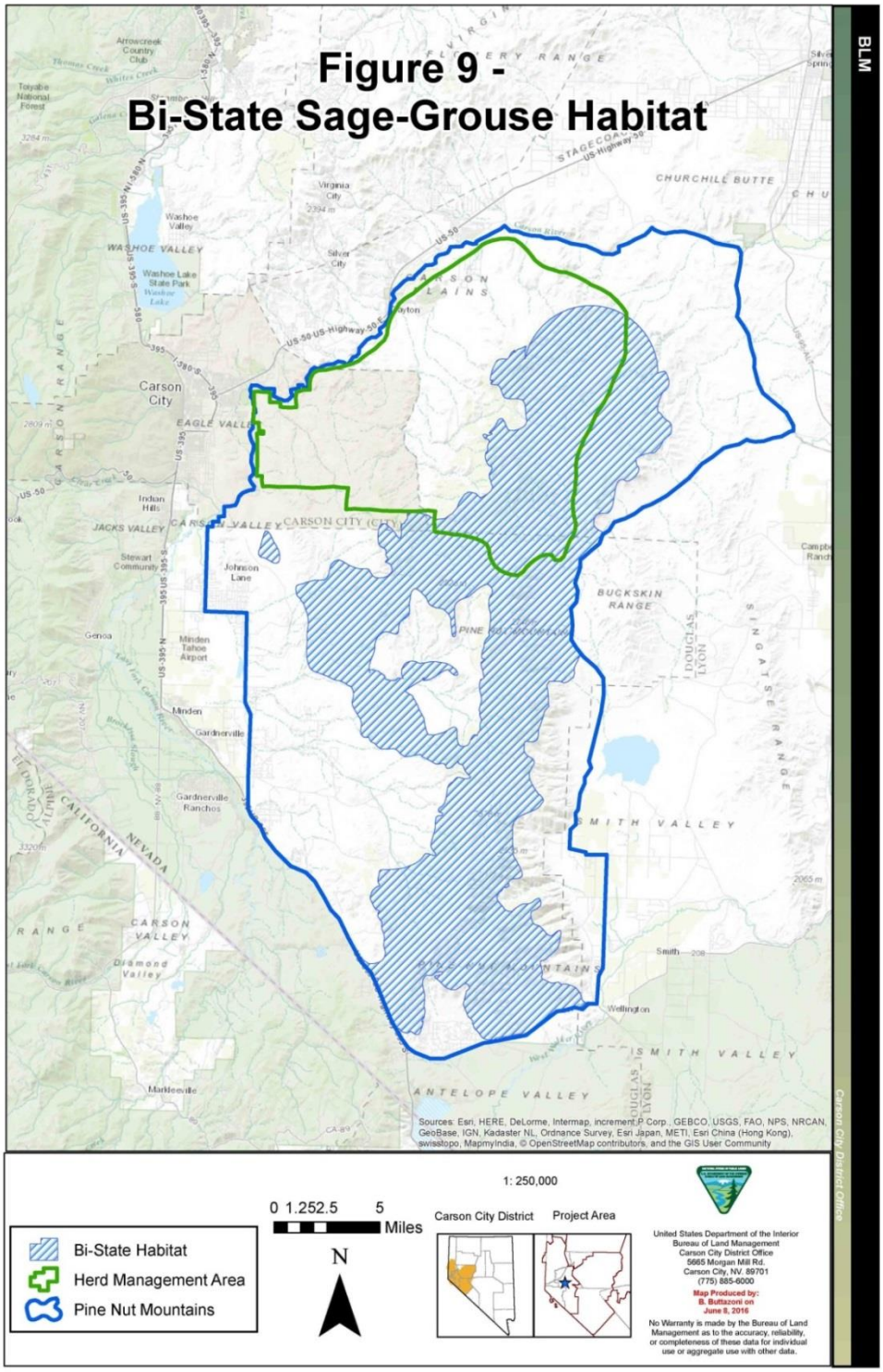

Figure 9, Bi-State Sage-Grouse Habitat

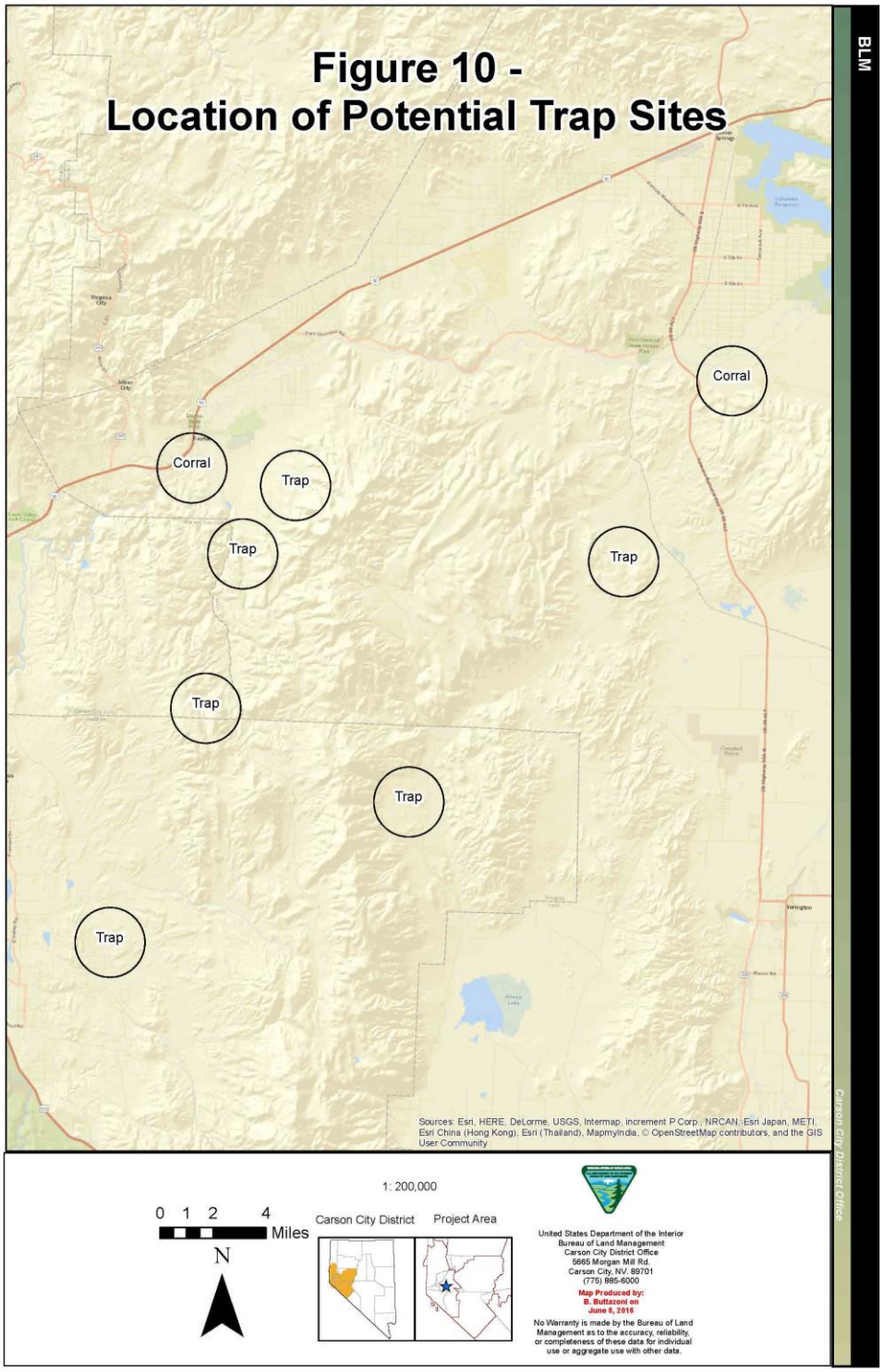

Figure 10, Location of Potential Trap Sites

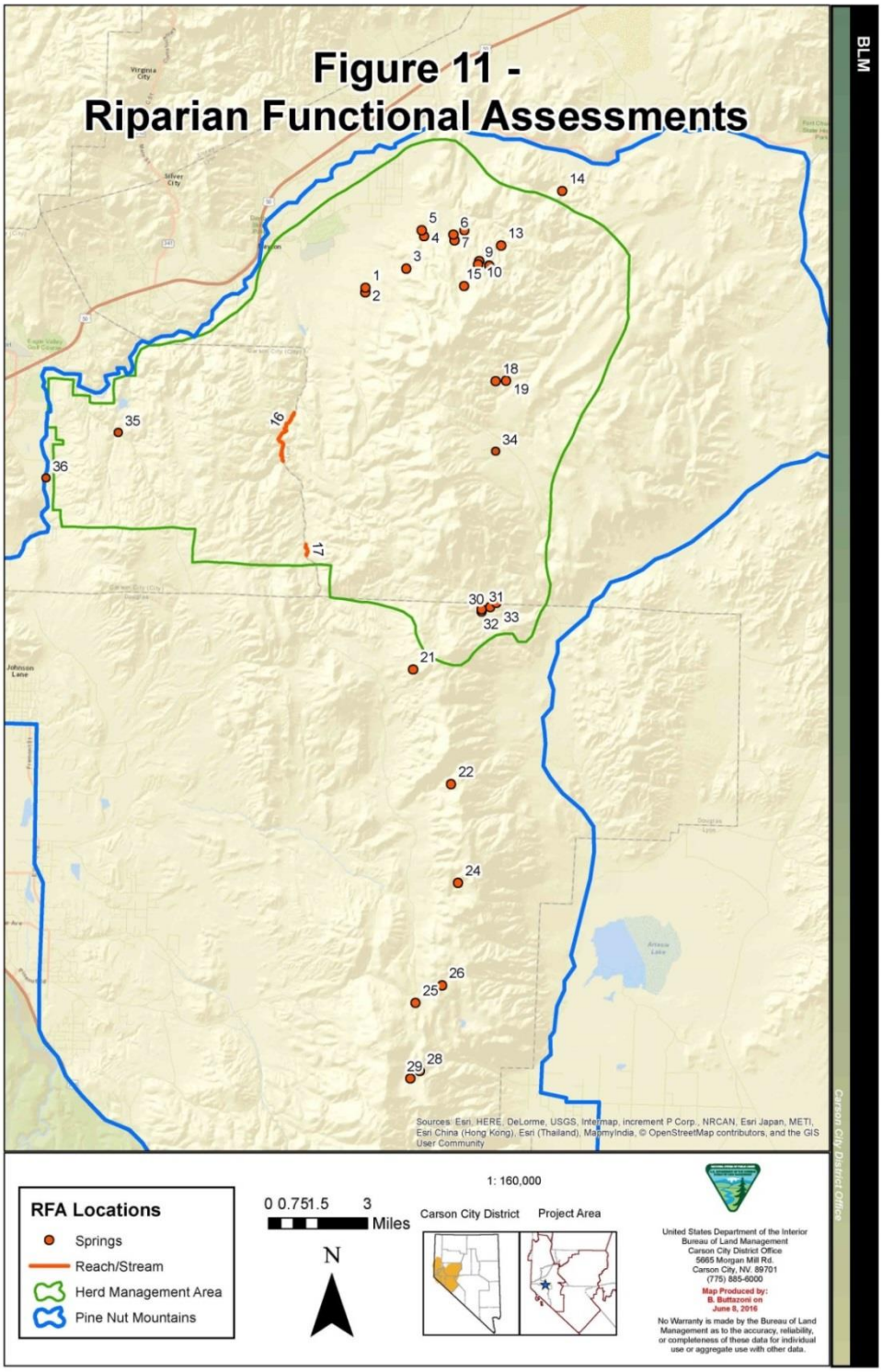

Figure 11, Riparian Functional Assessments

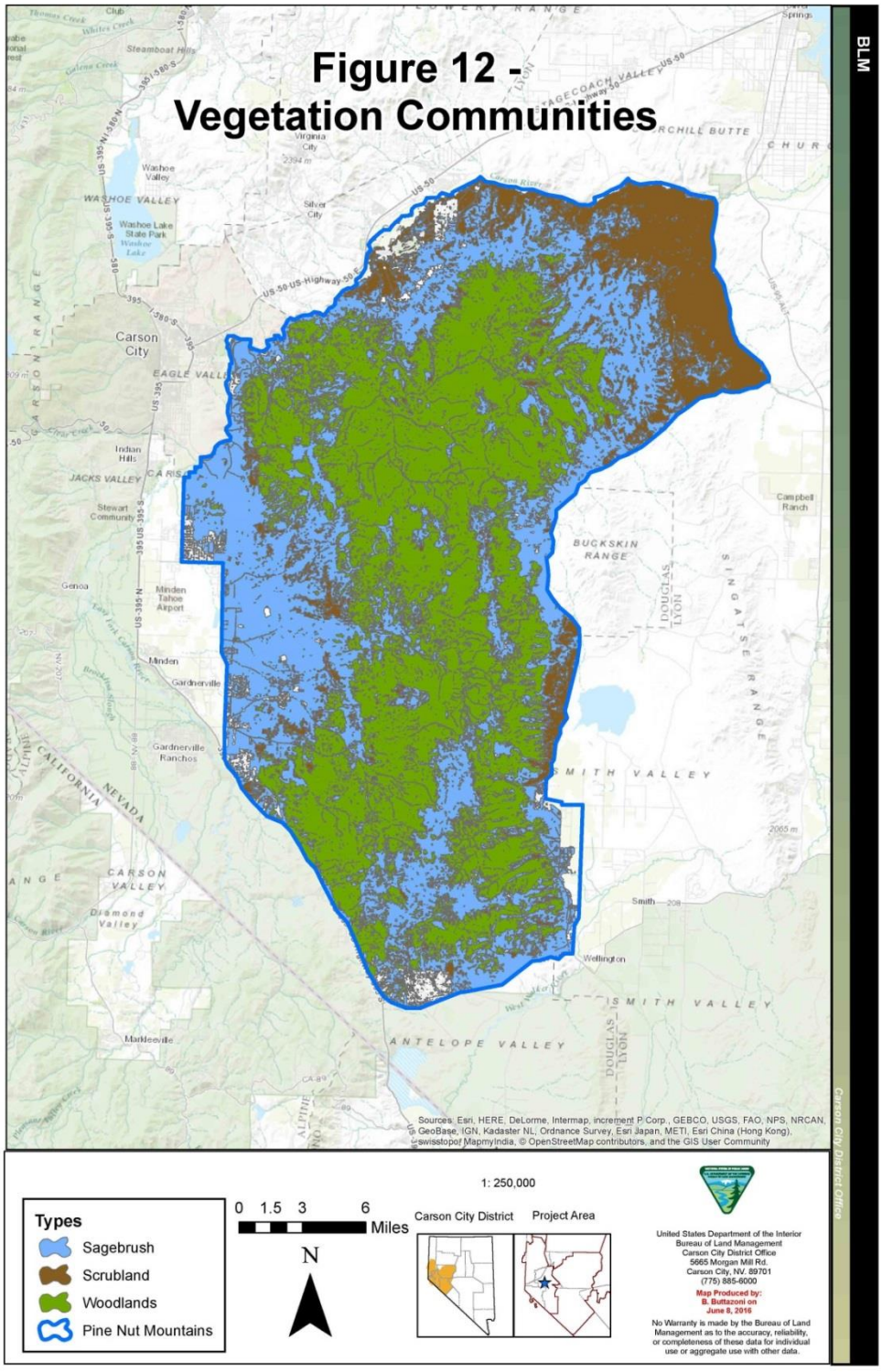

Figure 12, Vegetation Communities

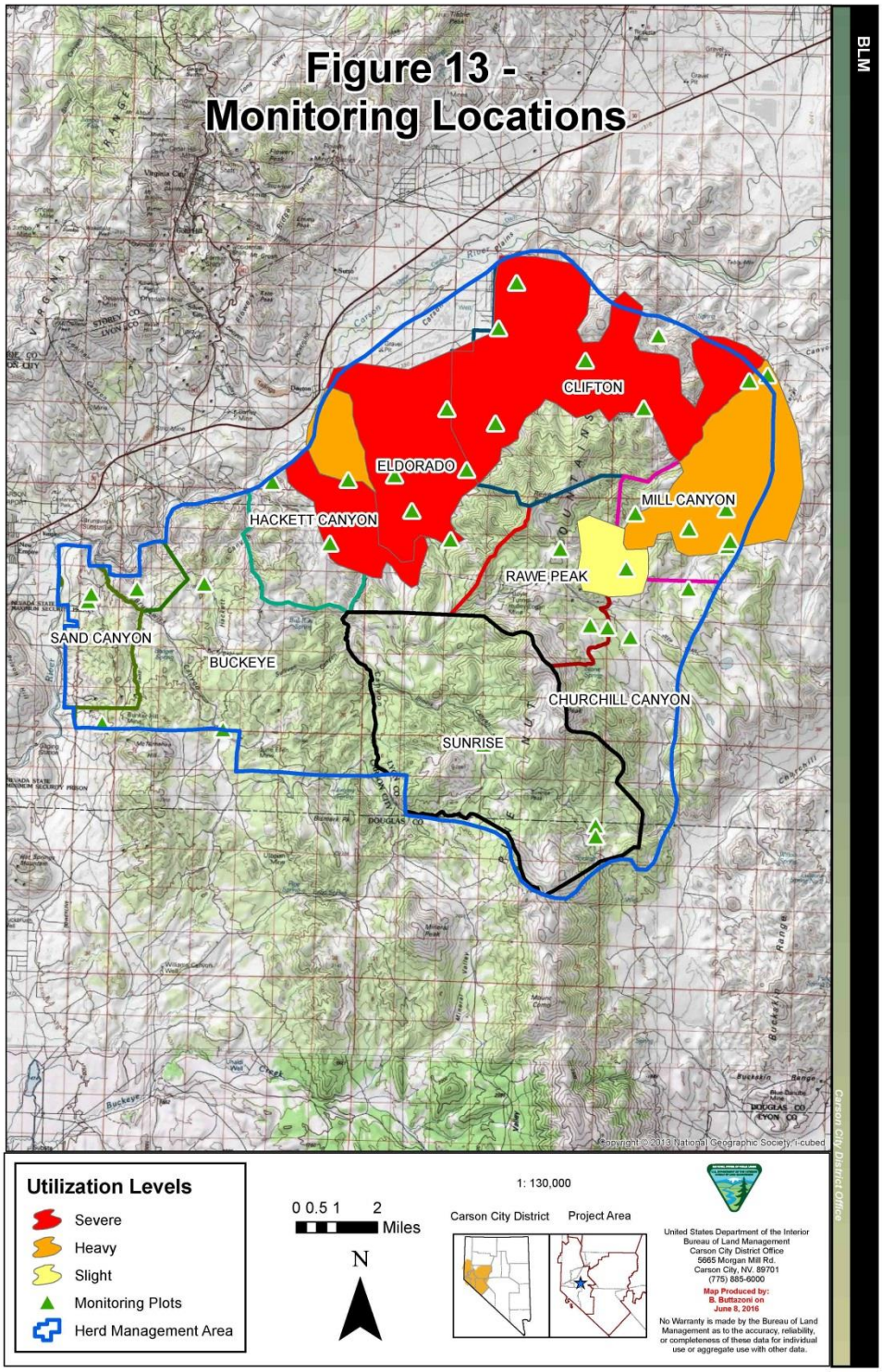

Figure 13, Monitoring Locations

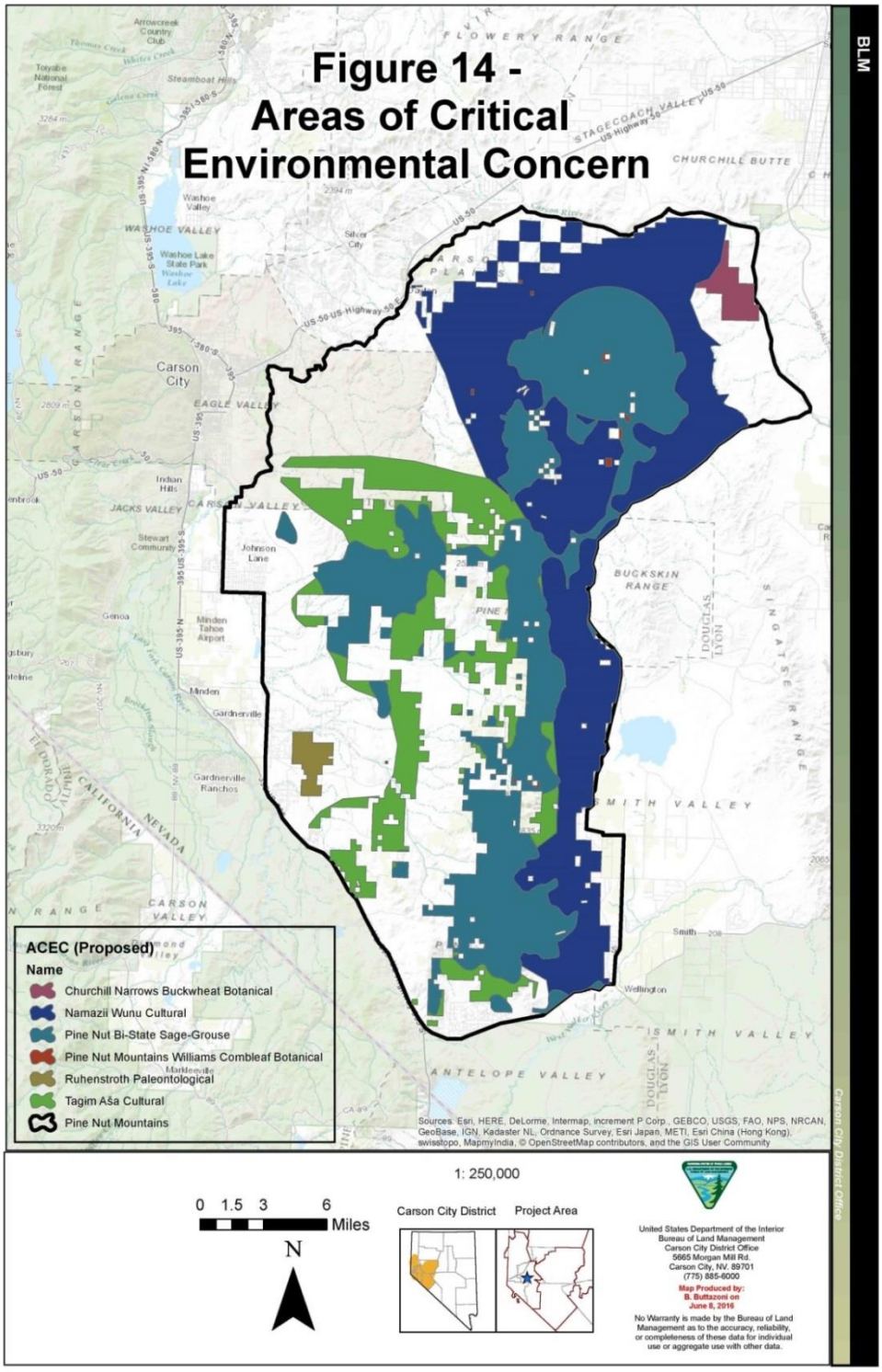

Figure 14, Areas of Critical Environmental Concern

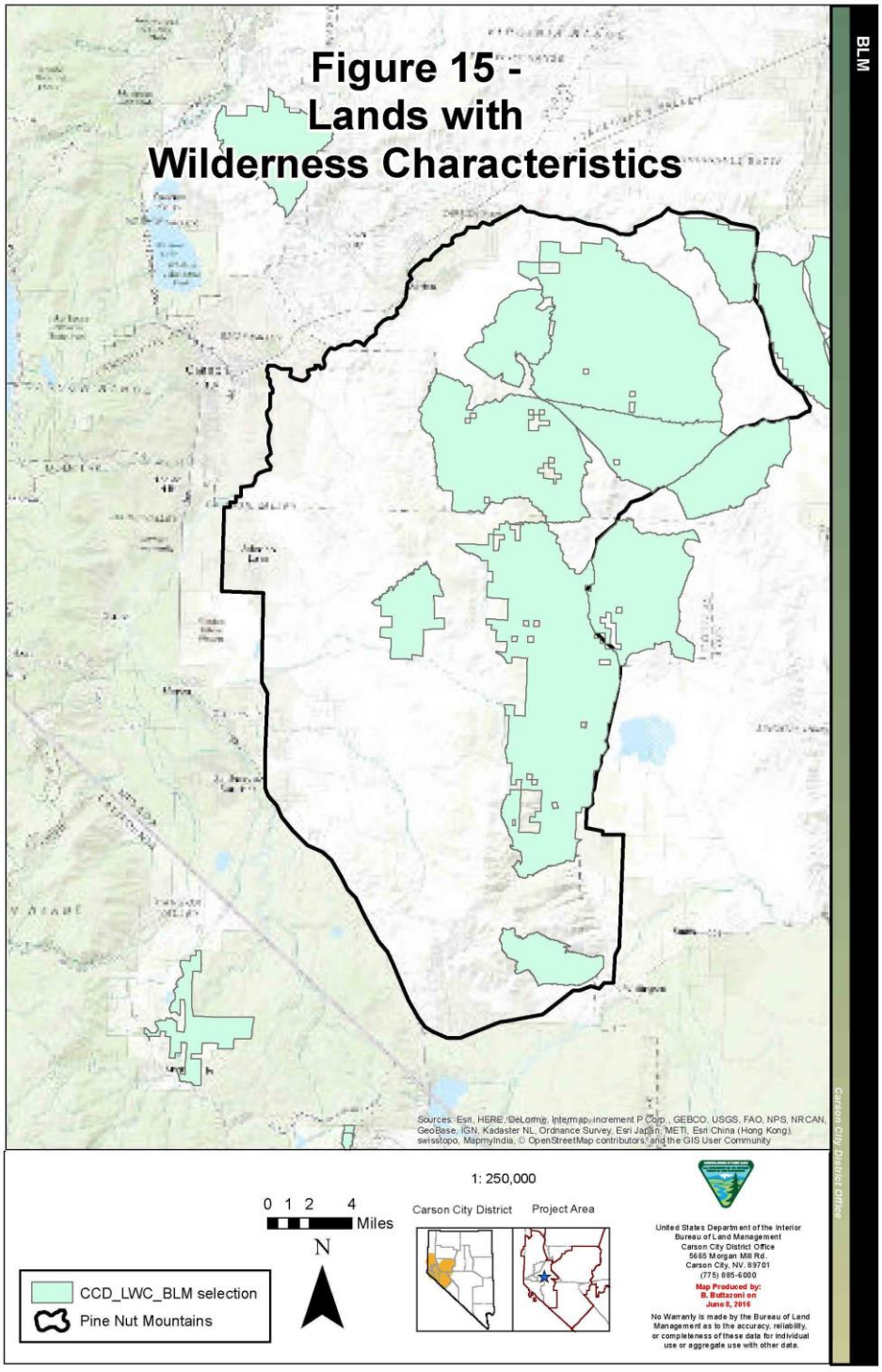

Figure 15, Lands with Wilderness Characteristics

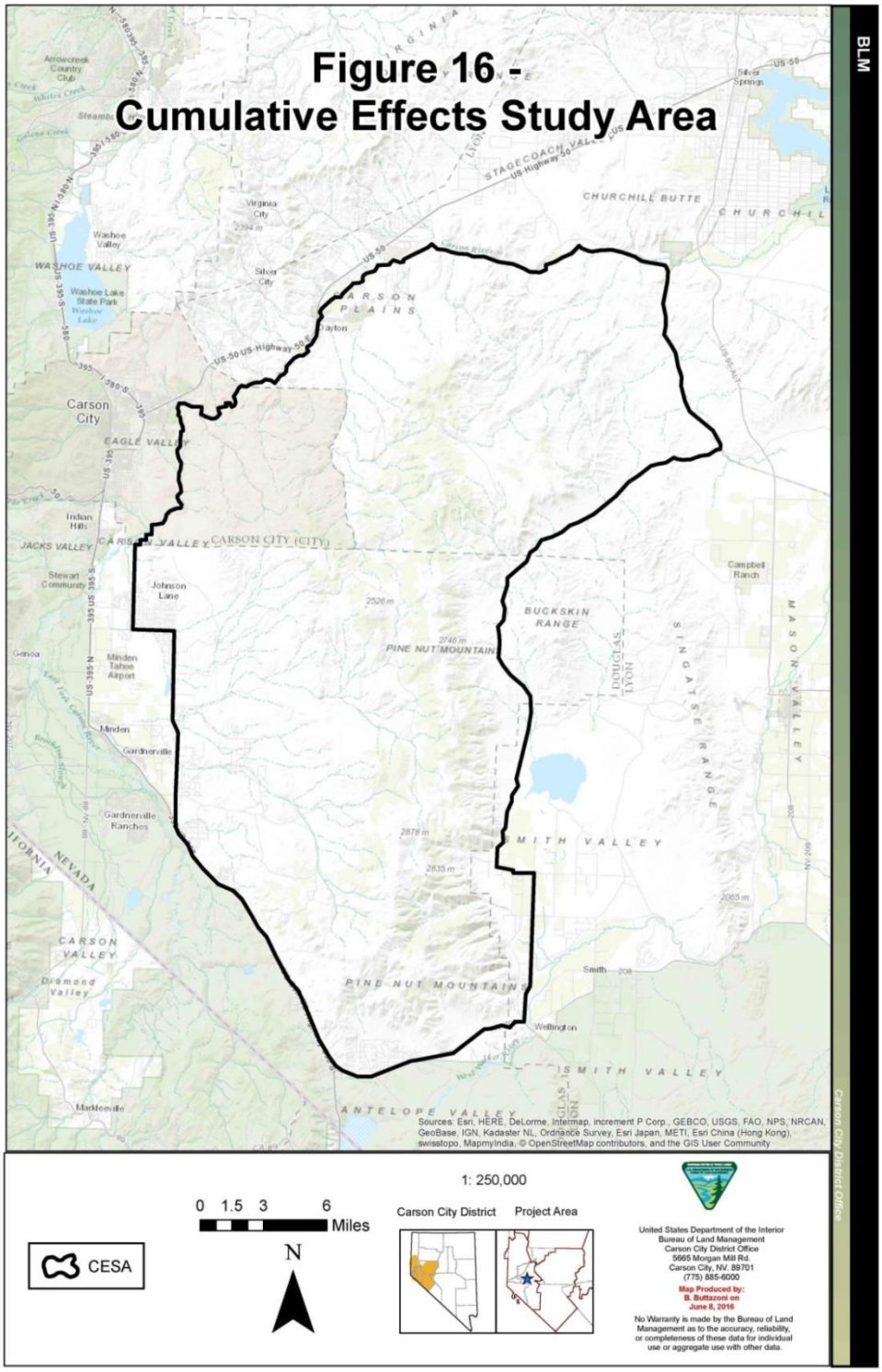

Figure 16, Cumulative Effects Study Area

9.0 Appendices

Appendix A. Riparian Functional Assessments (RFA).

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment/Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
1	Nettles Spring Complex (aka Fiddlers Spring, aka Party Spring)	281772	4344484	Clifton/No permitted use	2002	Yes	NF	"Wild horse use of Nettles Spring has denuded the area and trampled the spring."
2	Little Nettles Spring	281762	4344269	Clifton/No permitted use	2002	Yes	FAR	"Wild horse use is heavy with grazing on small willows evident. Impacts to channel from wild horse use are severe in places; channel banks, vegetation and water quality are affected. Downward trend."
3	Dangberg Spring	283755	4345414	Clifton/No permitted use	2015	Yes	NF	"Excessive horse use is degrading and compacting soils at the site."
4	Rush Spring	284623	4346985	Clifton/No permitted use	1993	Yes	FAR	Horses are compacting soils. Flow may be lost. Downward trend.
5	Egus Spring	284507	4347291	Clifton/No permitted use	<1995	Yes	FAR	No field notes. Photo comparison (1988 and 2014) tells story of downward trend.
6	Populus Spring (aka Hazlett Spring, aka Roadside Spring)	286054	4347065	Clifton/No permitted use	1994, 2013	Yes	FAR (1994), NF (2013)	1994: "Horses are keeping riparian vegetation cleared off with no regeneration occurring. Horses are adversely affecting surrounding watershed. Downward trend." 2013: "Denuded, heavy horse use, hoof action may be decreasing flow, compacted soils."
7	Pine Spring	286108	4346803	Clifton/No permitted use	1988, 2015	Yes	FAR, before rating method (1988), NF (2015)	1988 (off Riparian Monitoring Checklist): "Fair condition with little horse use documented." 2015: "Hydric soils are compacted from hoof action. Excessive horse use is degrading site."
8	Rose Spring	286592	4347291	Clifton/No permitted use	2014	Yes	NF	"Excessive horse use is impacting functionality."
9	West Barton Spring	287250	4345625	Clifton/No permitted use	<1995, 2002, 2013, 2015	Yes	PFC (<1995), FAR (2002), FAR (2013), FAR (2015)	A enclosure fence was built after the 2002 assessment to reduce wild horse impacts to the site. The riparian area was in recovery in 2013 (25 identified species of riparian vegetation), but with the fence down in 2013-2015 the riparian vegetation has been impacted and the current

								rating reflects a downward trend due to heavy/excessive horse use.
10	East Barton Spring	287307	4345781	Clifton/No permitted use	<1995, 2013	Yes	PFC (<1995), NF (2013)	The confining layer allowing surface water expression was anthropogenically punctured. East Barton Spring no longer exists.
11	Hercules Meadow (Mine) Spring	287805	4345551	Clifton/No permitted use	<1995, 2013	Yes	FAR (<1995), PFC (2013)	"A lot of wild horse trails and sign around enclosure." The enclosure is protecting the area.
12	Hercules Spring	287800	4345561	Clifton/No permitted use	2014	Yes	NF	"Excessive horse use is impacting riparian functionality."
13	Lower Hercules Spring	288376	4346541	Clifton/No permitted use	2014	Yes	NF	"Excessive horse use is preventing recruitment of cottonwood and other riparian vegetation and causing negative impacts on soils and their hydric characteristics."
Map ID	Name	UTM_X	UTM_Y	Grazing Allotment/Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
14	Urrutia Spring	291367	4349199	Clifton/No permitted use	1988	No	NF, before rating method	1988 (off Riparian Monitoring Checklist): "Trampling of small meadow by cattle. Meadow dried up due to water development. No JDR."
15	Rawe Peak N. Spring	286582	4344557	Rawe Peak/No permitted use	<1995	Yes	PFC, NF (2014)	No supporting documentation of PFC rating was found. Rating was gleaned from Rawe Peak Allotment Evaluation (1995). Spring was dry in 1980 Water Source Inventory. Spring is dry, has been for some time.
16	Middle Eldorado Canyon	n/a	n/a	Eldorado Canyon / Hackett Canyon	2002	Yes	PFC	RFA covered a stream reach in T.15 N., R. 22 E., Sections 30 & 31.
17	Upper Eldorado Canyon	n/a	n/a	Sunrise/ Buckeye Allotments	2002	Yes	FAR	RFA covered a stream reach in T.14 N., R. 22 E., Section 6. Rating due to erosion and road management issues.
18	Greg's Cabin Meadow Spring	288113	4339926	Mill Canyon/No permitted use	<1995, 2002, 2013	Yes	FAR (<1995), NF (2002), NF (2013)	<1995: No field notes. 2002: "Lack of water flow and heavy grazing are the two major impacts to resource. The meadow was grazed in an extreme manor by both wild horses and cattle. There was no authorized use in the allotment." 2013: "Riparian vegetation is dead or dying. Riparian area is severely degraded due to lack of water. Horse evidence."
19	Pony	288627	4339954	Mill Canyon/No	2012	Yes	FAR	2012: Artesian well acting as spring head and supporting

	Meadow Artesian Well			permitted use				riparian area below dried out meadow. "Rating due to knickpoint, expanding Canada and Bull Thistle (noxious weeds), and wild horse hoof action causing disturbance of surface and subsurface flow patterns."
20	Poor Geometry Spring	284088	4325880	Pine Nut	2004	No	FAR	"Rating due to horse impacts."
21	D019	n/a	n/a	Pine Nut	2013	No	NF	"Dry meadow, no surface water left. Old headcuts. No noxious weeds present. Long term drying trend." Wild horse presence was not documented.
22*	PN-T-D018 high elevation seep	285940	4320310	Pine Nut	2013	No	PFC	"Wild horses present outside HMA. This water source supports a healthy aspen stand."
23*	PN-T-D018 lower seep in drainage	285940	4320310	Pine Nut	2013	No	NF	"Denuded area, multiple trails in and out. Sedges, juncus and yarrow are being over grazed. Roots exposed with excessive erosion. Hoof action is compacting soils. Horse sign present. Wild horses present outside HMA."
24	Sheep Trough Spring	286283	4315495	Pine Nut	2014	No	NF	"Excessive horse use and lack of riparian vegetation. Horses outside of HMA."
25	Sage Hen Enclosure	284211	4309648	Pine Nut	2013	No	FAR	"Lack of water causing meadow characteristics to shrink, thistle present. Fence in need of maintenance. Historic disturbance. Downward trend." Horse presence not documented.
26	South Dry Meadow Complex	285503	4310506	Pine Nut	2013	No	Not Riparian	"Topographically low areas where seasonal water collects."

Map ID	Name	UTM_X	UTM_Y	Grazing Allotment/Status	Year	Within HMA?	Status/Trend	Comments from Riparian Functional Assessment
27	Top of Pipeline Canyon-Upper Meadow	284415	4306326	Pine Nut	2012	No	FAR	"Evidence of year round grazing by wild horses. Old skeletons. Fence down. Hoof shearing is altering surface and subsurface flow. Knickpoint present. Downward trend."
28	Top of Pipeline	284415	4306326	Pine Nut	2012	No	FAR	"Wild horse use, willow utilization, annilation and degradation. No noxious weeds documented. No apparent

	Canyon-Lower Meadow							trend. Lower meadow would respond quickly if horse pressure was removed."
29	Winters Mine Spring	283947	4305958	Pine Nut	2012	No	FAR	"Unstable system due to historic mining, road system and active head cutting. Wild horses are perpetually browsing and trailing. Outside of HMA. No noxious weeds. Mousetail in general vicinity. Downward trend."
30	Unnamed Spring	287430	4328703	Sunrise	2015	Yes	NF	"Lack of water due to pinyon-juniper encroachment"
31	Chaining Spring	287609	4328822	Sunrise	2015	Yes	FAR	"Lower fence line was placed too high in riparian area causing instability of system, high risk of downward trend from any grazing pressure along fence line. Unstable system is reason for downward trend."
32	East Chaining Spring	287857	4328929	Sunrise	2015	Yes	PFC	"Past hoof action from cattle grazing has caused surface and subsurface flow disturbance. Large (24-30") pedestals. Removal of grazing pressure is allowing site to begin recovery."
33	Unnamed Stream	288146	4329123	Sunrise	2015	Yes	PFC	"Lotic area, stream reach below willows is stable and could dissipate high energy storm events. No horse sign observed."
34	Mud Spring	288113	4336509	Churchill Canyon	2007	Yes	NF	"Excessive erosion due to headcutting."
35	Tapemeck Spring	269709	4337432	Sand Canyon	2000	Yes	PFC	"Riparian area popped up with effluent pond coming on-line. No wild horse or livestock sign."
36	Carson River reach	266192	4335208	Sand Canyon	2000	Yes	PFC	"Reach stream type C3 or C4 with a moving stream course." Site location estimated.

Rating key: PFC-NC = Proper Functioning Condition, Not Rated Trend
FAR-NA = Functional-At-Risk, Not Apparent Trend
FAR-UP = Functional-At-Risk, Upward Trend
FAR-DOWN – Functional-At-Risk, Downward Trend
NF = Non-Functional

*Same location on Figure 10.

Appendix B: BLM Sensitive Animals and Migratory Birds That May be Present or Their Habitat May be Present in the Pine Nut Mountains.

Common Name	Scientific Name	BLM Sensitive Species	BLM Migratory Bird
Big brown bat	*Eptesicus fuscus*	Y	-
Brazilian free-tailed bat	*Tadarida braziliensis*	Y	-
Brewer's sparrow	*Spizella breweri*	Y	Y
Burrowing owl	*Athene cunicularia*	Y	N
California myotis	*Myotis californicus*	Y	-
Dark kangaroo mouse	*Microdipodops megacephalus*	Y	-
Ferruginous hawk	*Buteo regalis*	Y	Y
Fringed myotis	*Myotis thysanodes*	Y	-
Golden eagle	*Aquila chrysaetos*	Y	Y
Greater sage-grouse (Bi-State DPS)	*Centrocercus urophasianus*	Y	N
Green-tailed towhee	*Pipilo chlorurus*	N	Y
Little brown bat	*Myotis lucifugus*	Y	-
Loggerhead shrike	*Lanius ludovicianus*	Y	Y
Long-eared myotis	*Myotis evotis*	Y	-
Long-legged myotis	*Myotis volans*	Y	-
Mourning dove	*Zenaida macroura*	N	Y
Northern goshawk	*Accipiter gentilis*	Y	N
Pale kangaroo mouse	*Microdipodops pallidus*	Y	-
Pallid bat	*Antrozous pallidus*	Y	-
Pinyon jay	*Gymnorhinus cyanocephalus*	Y	Y
Sage sparrow	*Amphispiza belli*	N	Y
Sage thrasher	*Oreoscoptes montanus*	Y	Y
Swainson's hawk	*Buteo swainsoni*	Y	N
Townsend's big-eared bat	*Corynorhinus townsendii*	Y	-
Virginia's warbler	*Vermivora virginiae*	N	Y
Western pipistrelle bat	*Pipistrellus hesperus*	Y	-
Western small-footed myotis	*Myotis ciliolabrum*	Y	-
Yuma myotis	*Myotis yumanensis*	Y	-

Appendix C: Results from WinEquus Population Modeling by Alternative.

Proposed Action, Alternative A. Gather to Low AML by Allotment and Treat Mares with PZP:

Alt. A: Totals in 11 Years*			
	Gathered	**Removed**	**Treated**
Lowest Trial	803	497	26
10th Percentile	860	565	39
25th Percentile	900	639	44
Median Trial	936	680	50
75th Percentile	1006	728	58
90th Percentile	1059	782	82
Highest Trial	1301	993	106

* 0 to 20+ year-old horses

Alt. A: Average Growth Rate in 10 Years	
Trial	Percent Growth Rate
Lowest Trial	3.6
10th Percentile	6.5
25th Percentile	7.3
Median Trial	8.8
75th Percentile	10.1
90th Percentile	11.3
Highest Trial	15.3

Alt. A: Population Sizes in 11 Years*			
	Minimum	Average	Maximum
Lowest Trial	71	193	583
10th Percentile	91	210	592
25th Percentile	98	221	609
Median Trial	110	234	633
75th Percentile	121	245	668
90th Percentile	130	262	718
Highest Trial	159	327	901

* 0 to 20+ year-old horses

Alternative B. Gather to Low AML by Allotment, Treat Mares with PZP and Adjust Sex Ratios, Some Horses would be spayed or gelded:

Alt. B: Totals in 11 Years*			
Trial	Gathered	Removed	Treated
Lowest Trial	751	509	39
10th Percentile	858	548	55
25th Percentile	903	634	60
Median Trial	944	684	68
75th Percentile	986	718	78
90th Percentile	1053	776	98
Highest Trial	1210	887	128

* 0 to 20+ year-old horses

Alt. B: Average Growth Rate in 10 Years	
Trial	Percent Growth Rate
Lowest Trial	1.7
10th Percentile	5.4
25th Percentile	6.4
Median Trial	8.2
75th Percentile	9.9
90th Percentile	11.3
Highest Trial	14.1

Alt. B: Population Sizes in 11 Years*			
Trial	Minimum	Average	Maximum
Lowest Trial	73	178	581
10th Percentile	89	208	598
25th Percentile	94	221	610
Median Trial	104	230	640
75th Percentile	120	240	671
90th Percentile	130	253	738
Highest Trial	159	293	810

* 0 to 20+ year-old horses

Alternative C. Gather to Low AML no Fertility Control:

Alt. C: Totals in 11 Years*		
Trial	Gathered	Removed
Lowest Trial	678	595
10th Percentile	890	764
25th Percentile	957	810
Median Trial	1004	864
75th Percentile	1086	934
90th Percentile	1170	1002
Highest Trial	1299	1110

* 0 to 20+ year-old horses

Alt. C: Average Growth Rate in 10 Years	
Trial	Percent Growth Rate
Lowest Trial	8.7
10th Percentile	10.2
25th Percentile	12.0
Median Trial	13.9
75th Percentile	15.0
90th Percentile	16.8
Highest Trial	18.9

Alt. C: Population Sizes in 11 Years*			
Trial	Minimum	Average	Maximum
Lowest Trial	104	233	584
10th Percentile	134	270	598
25th Percentile	148	285	606
Median Trial	160	310	628
75th Percentile	193	336	662
90th Percentile	210	366	685
Highest Trial	268	409	817

* 0 to 20+ year-old horses

Alternative D. No Action, no Contraception and no Removals:

Alt. D: Average Growth Rate in 10 Years	
Trial	Percent Growth Rate
Lowest Trial	16.1
10th Percentile	17.7
25th Percentile	18.9
Median Trial	20.1
75th Percentile	21.2
90th Percentile	22.7
Highest Trial	24.2

Alt. D: Population Sizes in 11 Years*			
	Minimum	Average	Maximum
Lowest Trial	571	1307	2691
10th Percentile	592	1621	3200
25th Percentile	611	1733	3652
Median Trial	630	1899	4052
75th Percentile	673	2074	4516
90th Percentile	720	2228	4894
Highest Trial	786	2416	5754

* 0 to 20+ year-old horses

Appendix D: Standard Operating Procedures for Field Castration.

Gelding will be performed with general anesthesia and by a veterinarian. The combination of pharmaceutical compounds used for anesthesia, method of physical restraint, and the specific surgical technique used will be at the discretion of the attending veterinarian with the approval of the authorized officer (I.M. 2009-063).

Pre-surgery Animal Selection, Handling and Care

1. Stallions selected for gelding will be greater than 6 months of age and less than 20 years of age.
2. All stallions selected for gelding will have a Henneke body condition score of 3 or greater. No animals which appear distressed, injured or in failing health or condition will be selected for gelding.
3. Stallions will not be gelded within 36 hours of capture and no animals that were roped during capture will be gelded at the temporary holding corrals for rerelease.
4. Whenever possible, a separate holding corral system will be constructed on site to accommodate the stallions that will be gelded. These gelding pens will include a minimum of 3 pens to serve as a working pen, recovery pen(s), and holding pen(s). An alley and squeeze chute built to the same specifications as the alley and squeeze chutes used in temporary holding corrals (solid sides in alley, minimum 30 feet in length, squeeze chute with non-slip floor) will be connected to the gelding pens.
5. When possible, stallions selected for gelding will be separated from the general population in the temporary holding corral into the gelding pens, prior to castration.
6. When it is not possible or practical to build a separate set of pens for gelding, the gelding operation will only proceed when adequate space is available to allow segregation of gelded animals from the general population of stallions following surgery. At no time will recently anesthetized animals be returned to the general population in a holding corral before they are fully recovered from anesthesia.
7. All animals in holding pens will have free access to water at all times. Water troughs will be removed from working and recovery pens prior to use.
8. Prior to surgery, animals in holding pens may be held off feed for a period of time (typically 12-24 hours) at the recommendation and direction of the attending veterinarian.
9. The final determination of which specific animals will be gelded will be based on the professional opinion of the attending veterinarian in consultation with the Authorized Officer.
10. Whether the procedure will proceed on a given day will be based on the discretion of the attending veterinarian in consultation with the Authorized Officer taking into consideration the prevailing weather, temperature, ground conditions and pen set up. If these field situations can't be remedied, the procedure will be delayed until they can be, the stallions will be transferred to a prep facility, gelded, and later returned, or they will be released to back to the range as intact stallions.

Gelding Procedure

1. All gelding operations will be performed under a general anesthetic administered by a qualified and experienced veterinarian. Stallions will be restrained in a portable squeeze chute to allow the veterinarian to administer the anesthesia.

2. The anesthetics used will be based on a xylazine/ketamine combination protocol. Drug dosages and combinations of additional drugs will be at the discretion of the attending veterinarian.
3. Animals may be held in the squeeze chute until the anesthetic takes effect or may be released into the working pen to allow the anesthesia to take effect. If recumbency and adequate anesthesia is not achieved following the initial dose of anesthetics, the animal will either be redosed or the surgery will not be performed on that animal at the discretion of the attending veterinarian.
4. Once recumbent, rope restraints or hobbles will be applied for the safety of the animal, the handlers and the veterinarian.
5. The specific surgical technique used will be at the discretion of the attending veterinarian.
6. Flunixin meglamine or an alternative analgesic medication will be administered prior to recovery from anesthesia at the professional discretion of the attending veterinarian.
7. Tetanus prophylaxis will be administered at the time of surgery.
8. Other medications may also be administered at the time of surgery at the professional discretion of the attending veterinarian.
9. All geldings will be allowed to recover from anesthesia within the working pen or the adjacent recovery pen. Once, fully recovered each gelding will be transferred to the gelding holding pen(s). Animals will remain segregated from intact stallions for at least 24 hours following surgery or until their release.
10. Any stallions determined or believed to be a cryptorchid will be allowed to recover from the anesthesia, marked for later recognition, and shipped to a BLM prep facility for appropriate surgery or euthanasia if it is determined that they cannot be fully castrated. At no time will a partial castration be performed. Because cryptorchidism is an inherited condition, cryptorchid stallions should never be released back into an HMA.
11. Gelded animals will be freeze marked on their left hip with an identifying mark to minimize the potential for future recapture and to facilitate post-treatment monitoring. Each State will establish its own marking system in compliance with their State Brand Board. For example, Nevada BLM will utilize the identifying freeze mark on the hip (to be determined) as well as a 2 inch "F" freeze mark on the left side of the neck per agreement with the NV Brand Board.

Post-operative handling, care and monitoring

1. All animals that have fully recovered from anesthesia will have free access to water and hay prior to subsequent release.
2. All geldings will be held at least overnight for observation. Animals will not be left unattended for at least 3 hours following the procedure.
3. The attending veterinarian will observe all animals 12-24 hours after the procedure or again prior to release. Geldings will be released no later than 48 hours following surgery near a water source in their home range when possible.
4. Any gelding observed have complications will be held at the gather site until his condition improves or be shipped to a holding facility until he is able to be returned to the range.
5. Gelded animals would be monitored periodically for complications for approximately 7-10 days post-surgery. This monitoring will be completed either through aerial recon if available or field observations from major roads and trails. It is not anticipated that all the

geldings will be observed but the goal is to detect complications if they are occurring and determine if the horses are freely moving about the HMA.

6. Animals found on the range with serious gelding complications will either be recaptured for treatment, if possible or euthanized as an act of mercy if necessary.
7. Observations of the long term outcomes of gelding will be recorded during routine resource monitoring work. Such observations will include but may not limited to band size, social interactions with other geldings and harem bands, distribution within their habitat, forage utilization and activities around key water sources.